REPORT ON THE CONSOLIDATION OF THE NATIONAL INFORMATION SYSTEM FOR SCIENCE AND TECHNOLOGY

Translation of "Kanaku gijutsu joho no zenkokuteki ryuzu taisei no seibi ni kan-suru hokoku ni tsuite," Report, Scientific and Technical Information Advisory Council, Tokyo, Japan, August 15, 1974, 78 pages plus 6 front matter pages

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16. Abstract The National Information System for Science and Technology (NIST), organized into an integrated center and subcenters, will take over the role of processing information from specialized fields and organizing retrieval and utilization programs. The subcenters -- specialized centers, data centers, regional service centers, clearing organizations, a central depository and others -- will be consolidated from existent organizations such as scientific societies and associations and industrial testing and research groups. The national government will take the lead in this consolidation, relying on the private sector for aid in their specialized fields. NIST will also participate in international exchanges of information and will conduct its own research and development in information processing and will be responsible for setting up university-level training programs for its personnel.

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August 15, 1974

To: Kinji Moriyama,
Minister of State, General
Director, Science and
Technology Agency

Benzaburō Katō,
Chairman, Scientific
and Technical Information
Advisory Council

REPORT ON THE CONSOLIDATION OF THE NATIONAL INFORMATION SYSTEM FOR SCIENCE AND TECHNOLOGY

1. The Scientific and Technical Information Advisory Council, in order to promote the concrete realization of the National Information System for Science and Technology (hereinafter abbreviated as "NIST"), has been engaged in deliberations, under a long-term perspective, concerning the manner in which work to consolidate the NIST ought to be pushed forward under the goal of its early realization. The results of the deliberations have been summarized in the enclosed document and are hereby reported to you.

2. Today, when science and technology have become so highly developed, the smooth circulation and efficient utilization of scientific and technical information is extremely important, not only for promoting the further development of science and technology, but also for connecting the results of research and development with actual applications.

The amount of scientific and technical information at the present time has reached an immense scale. Approximately four million scientific papers are produced yearly, and it is anticipated that this amount will be doubled in about 10 years. For this reason, researchers and specialists are forced to spend more and more time in the acquisition of information. Under the current conditions, some 30% to 50% of the time spent in research and development is expended for the acquisition and evaluation of information.

In cases where reliable information is not readily accessible, duplications and delays in research and development occur. This brings about a decrease in the efficiency of research and development. It is also believed that it may possibly impede the sound development of this country's science and technology.

On account of these circumstances, there have been increasing demands on the part of the utilizers of the information for a consolidation of the information system of science and technology, including increased efficiency of the information retrieval for rapid and accurate acquisition of information, the provision of broader ranges of information, and clearing services.

3. Consequently, it is believed that in our country there is an urgent need to consolidate the information system for science and technology, which is still inadequate. In this consolidation, it is essential for the national government to take the lead in consolidating the information system in order to promote smooth circulation of scientific and technical information, its multi-faceted utilization, and information services in the public sector.

4. Information agencies such as the Japan Information Center of Science and Technology are already in operation in this country. In addition, under the impetus of the Fourth Report of the Council for Science and Technology in 1969, studies on the consolidation of information systems for science and technology have been going forward in the related government agencies and in nongovernmental scientific associations and societies. Quite recently, some of these have reached the stage of taking concrete form.

In the other major countries, such as the United States, Great Britain, France, West Germany, and the Soviet Union, the importance of appropriate control and utilization of scientific and technical information was realized at an early date. Progress has been made in consolidating their systems, and the scientific and technical information policy is playing a vital role in scientific and technical policy.

It is believed that it will be an urgent task for this country as well, in order to keep abreast of these countries in promoting science and technology, to focus attention on the dissemination of scientific and technical information as one of the mainstays of the nation's scientific and technical policy and to promote it concretely.

5. This report, based on the concepts outlined above, summarizes the policies to be implemented in the future concerning consolidation of the information system of science and technology.

The government is requested to take effective measures to consolidate the national information system along the lines of this report, so that it will be well-coordinated as a whole and efficient.

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Chapter 1. Basic Concepts for Promoting Scientific and Technical Information Activity /1*

Section 1. Basic Ideas in Promoting the Consolidation of NIST

The amount of scientific and technical information has been increasing rapidly together with the swift advances of science and technology, and the demand for it has also been increasing and becomes more and more diversified.

The smooth dissemination of scientific and technical information has always been regarded as an indispensable condition for the advance of science and technology, and especially in recent years, as various projects connected with social development have been promoted, as problems of environmental pollution have manifested themselves openly, and as problems of natural resources and energy have become more serious, there have been heightened demands for accurate processing and utilization of the diversified scientific and technical information connected with these matters. Consequently, scientific and technical information activity must be promoted powerfully as part of scientific and technical policy.

The concept of NIST was proposed against this basic background. However, in concretizing this concept, rather than regarding NIST in itself as a single system, it is believed to be preferable to move forward regarding it as a unified system embracing many subsystems or various different elements.

The concrete methods of moving forward with consolidation are summarized in the following sections. The basic ideas underlying this are the following.

First of all, scientific and technical information activity ought to be carried out in a planned manner on the basis of an overall, long-term viewpoint. Scientific and technical information activity is extremely complex and many-faceted, and large amounts of funds and manpower will be necessary to consolidate NIST. On the other hand, since this activity is so extremely /2
fundamental, it is not easy to grasp its results accurately and to evaluate them.

Consequently, in carrying this work forward, it is necessary to move in a planned manner from a comprehensive standpoint in

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* Numbers in the margin indicate pagination in the foreign text.

order to clarify the basic orientation and to utilize the funds and personnel efficiently.

Second, the NIST plan ought to be carried forward from a national standpoint with close cooperation between all related agencies. NIST includes information activities in the private sector, as well as the diversified activities carried on by national and local governments. Viewed from the functional standpoint as well, it consists of various elements. Consequently, for the sake of efficient operation of NIST, it is necessary for the various agencies to collaborate and complement each other from a broad viewpoint, for full use to be made of information processes techniques such as electronic computers and communications techniques, which have developed so remarkably in recent times, and for a system which is well coordinated as a whole to be formed.

Third, activities which are closely attuned to the information requirements of the user ought to be carried out.

In promoting information activities, it must be possible to respond accurately to the needs of the users, who are researchers, specialists, and various layers of the national population. This means refinement of the information activities in order to make it possible to supply and acquire information rapidly and accurately, diversification of the contents of the information services, and correction of regional imbalances in the dissemination of information. For this reason, although one must naturally respect the efficiency of the whole, it is believed that it would not necessarily be appropriate to bring to the forefront immediate economic considerations alone.

Fourth, there is collaboration between NIST and other information systems. There are movements towards forming an administrative information system as well as a number of other nationwide information systems. It will be necessary to foster cooperation with these as far as possible. Assuming the realization of an on-line network at some time in the future, it will be necessary to arrange, by means of joint use of communications lines, to make it possible to connect up easily with other systems, thus increasing the efficiency of the investments of the national government. /3

Fifth, activities to disseminate scientific and technical information ought to be carried out on the basis of the ideal of international cooperation.

Scientific and technical information essentially has an international character. Since the advantages to this country coming from such exchanges are extremely great, it is necessary to participate positively in them through international agencies, etc.,

and to contribute to smoothing out international exchange activities in general. In particular, as this country's international position is improved, it will be necessary for it to discharge its international responsibilities in a fitting manner and to make a contribution to improving the world's scientific and technical levels.

Section 2. Basic Framework of NIST

The information to be dealt with in NIST is published information concerning science and technology (excluding that having to do only with the humanities -- the same applies below).

This scientific and technical information may be of various types and forms, such as periodicals, technical reports, scientific papers, proceedings of conventions of scientific associations and other published monographs, as well as materials concerning numerical data obtained from surveys and observations, figures, tables, etc., and materials such as published patent specifications, catalogs, technical standards, etc. The nature of the demand for these types of information and the methods of processing the information may also differ depending upon the purposes or duty of each scientific and technical activity.

For this reason, NIST will need to have a number of typical functions categorized depending upon whether the materials are published monographs or numerical data, what is the field being handled, and whether the processing is to be of an especially high priority or not. /4

NIST is a system for dissemination of scientific and technical information in which these various functions and the organizations which carry them out are organically linked by a tightly knit, nationwide network. Its basic framework is composed as shown in Table 1.

Chapter 2. Measures to be Taken to Promote Scientific and Technical Information Activity /7

The basic aim of this plan is for NIST to promote scientific and technical information activity under a long-term perspective, and to achieve the desired goals at the earliest possible date.

For this purpose, the implementation of each definite policy must be planned in accordance with the basic ideas outlined above. Concretely, it is desired that the following measures be taken.

This applies to the manner of implementing the immediate measures. However, even though the total framework of NIST was borne in mind, in organizing the ideas it proved necessary to place

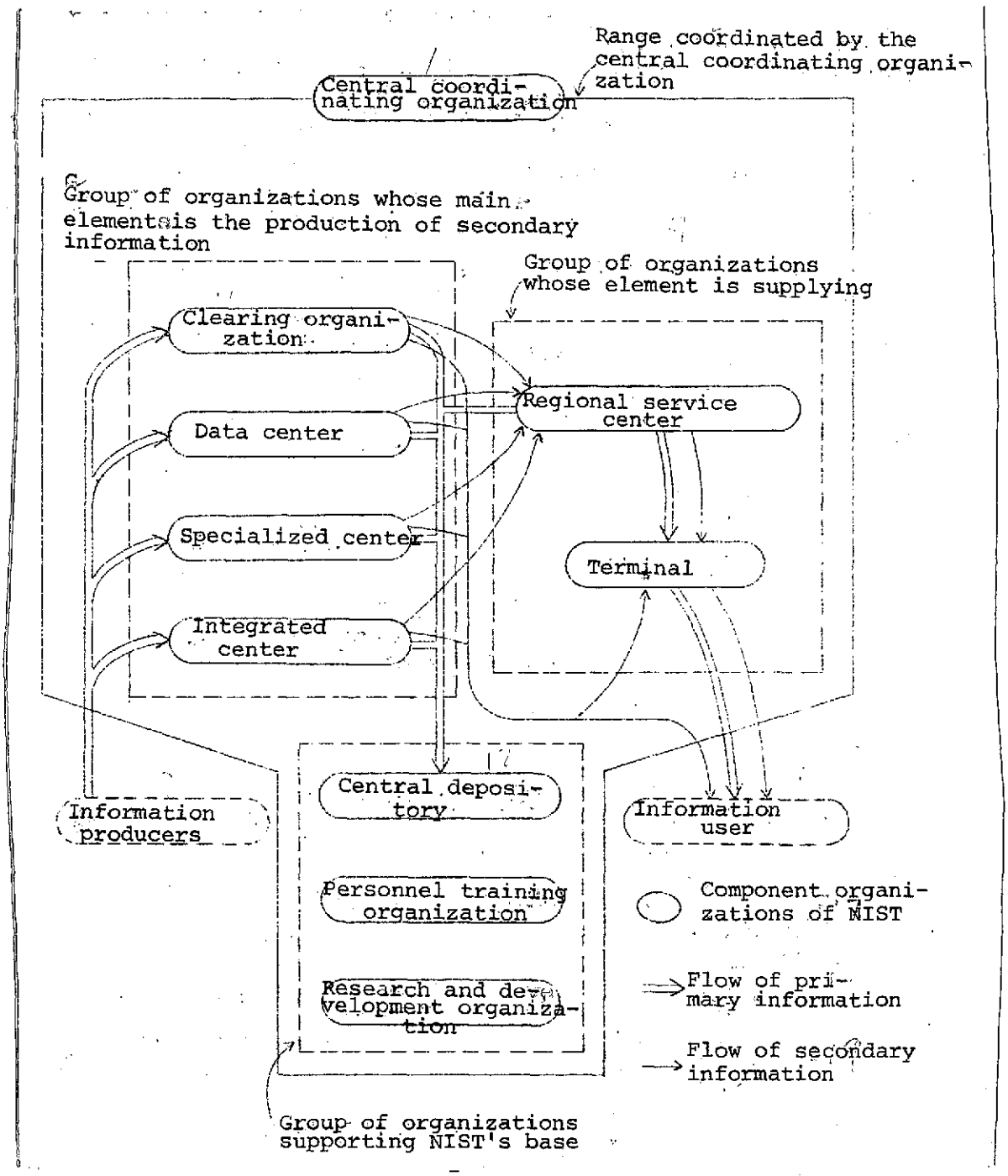


Fig. 1. Basic framework of NIST

TABLE 1. ROLES PLAYED BY THE COMPONENT ORGANIZATIONS OF NIST /6

Component organizations of NIST	Main roles			
Central coordinating organization	Comprehensive consolidation of NIST, comprehensive coordination of the various component agencies			
Clearing organization	Those whose main element is the processing of information	Nonmonographic information such as information sources and works in progress		Collecting, organizing, processing, and supplying information about information sources, etc.
Data center		Chiefly numerical data		Collecting, organizing, analyzing, evaluating and supplying numerical
Specialized center		Chiefly monographic material	Monographic material in specific specialized fields	① Collecting, organizing, processing and supplying monographic materials for specialized fields ② Technical analysis and evaluation of information
Integrated center			Basic monographic material common to all fields of science and technology	① Collecting, organizing, processing and supplying common, basic information ② Backup for the specialized centers
Regional service center	Those whose main element is supplying information	Supplying		Information services for users in each region
Terminal		Relaying		Relaying of information services
Central depository	Those whose main element is creating the basis for the activities of the component organizations of NIST			Storage of monographic materials
Personnel training organization				Fostering and training of information specialists
Research and development organization				Research and development of information processing techniques

priorities on the implementation of certain individual items because of the extreme imbalance in the levels of the various information activities at the present stage.

Concerning this point, it is desirable, when implementing each of the various measures in the future, to hold liaison conferences among each of the related organizations, centering in the central coordinating organization, so that it will be possible to form an information dissemination system which will be efficient as a whole.

There were some points for which adequately concrete measures could not be indicated in this report, and it is also possible that discrepancies may occur in the plan on account of future changes in conditions. Therefore, it will be necessary to make follow-ups of the plan from time to time.

For this reason, it would be desirable for follow-ups to be performed every year concerning the promotion of scientific and technical information activity in general, preferably centering around the central coordinating organization, and for the results to be summarized and published in the form of annual reports so as to contribute to the business operations in the following and succeeding years. At certain times it would also be desirable to make revisions in the plan.

The central coordinating organization will be the central nucleus for promoting the comprehensive implementation of NIST and for liaison and coordination when necessary. It is desired that the suitable deliberative organizations and administrative organs be consolidated at an early date so that this organization will be able to carry out its duties. For the time being, an organization carrying on the functions currently being carried out, consisting of this Advisory Council, an interagency liaison council, and the secretariat, ought to be enabled to carry out these functions with the cooperation of the related agencies. /8

In the operation of the central coordinating organization, the related governmental agencies and other related persons ought to be contact and consulted, and their respective standpoints and opinions ought to be adequately reflected.

Section 1. Consolidation of the Component Organizations of NIST

1. Measures for Consolidating the Integrated Center

(1) Roles and Duties

The main purpose of the integrated center is to function as the central agency of NIST in processing the basic monographic information which is common to all fields of science and technology (hereinafter called "basic information," files of basic information called "basic information files") in order to meet the general, broad needs for information. Together with this, it will

perform whatever duties which it is felt, from a nationwide viewpoint, could be most efficiently performed by the central agency of NIST (such as consolidation of the regional service centers, promotion of the clearing work, etc.) as well as the basic business of NIST (such as training personnel, consolidating the central depository, etc.).

In order to fulfill this role, the integrated center will perform the following functions. (Since the contents of the last-mentioned functions -- consolidation of the regional service centers and training of personnel -- will be described in the respective sections, here we will describe chiefly the former functions -- processing of basic information and services utilizing the results.) /9

(1) To collect and organize comprehensively basic information for all fields of science and technology, and to provide services utilizing them such as copying, translation, etc.

(2) To process the collected and organized information by means of abstracting and indexing, to compile basic information files in a form in which computers can be utilized, and to provide services utilizing them such as retrieval and surveys. (Note: The basic information files shall be files containing the bibliographical information, classifications, key word indexes, and, as far as possible, abstracts for the basic information. The information filed shall be processed in a form in which computers can be utilized.)

(3) To perform various consultant services for other information agencies on the basis of a broad and high degree of potentiality concerning scientific and technical information activity.

(2) Consolidation Procedures for the Integrated Center

The Japan Information Center of Science and Technology has been established and is currently carrying on effective activities as the nuclear information agency in this country. Therefore, it would be efficacious to enrich its contents as the integrated center by amplifying its activities or by adding new functions to it. For this purpose, the duties of the Japan Information Center of Science and Technology will be consolidated more or less in the following manner.

(1) Amplification of the Information Files

The scope of the basic information collected will be gradually expanded, aiming at a goal of collecting and processing 15-20% of the scientific and technical monographic information generated throughout the world.

The Japan Information Center of Science and Technology is currently collecting and processing chiefly information from the fields of physics and engineering. However, it will be necessary /10
to expand the basic information files by adding information from other fields such as biology, medicine, and agriculture through work-sharing and cooperation with other specialized centers.

It is necessary for the integrated center to collect, not only information which is used in common in all fields and which has a high frequency of utilization, but also other information which would be important in the way of basic information. Therefore, more attention must be given to making the work of the center all-embracing, rather than to questions of whether the work is profitable or not.

(2) Strengthening the Service Functions

In order to cope with the increased amounts of data processed in the files and the expansion of the fields to be handled, it will be necessary to improve the retrieval efficiency and the precision of retrieval. Work must be done to develop and utilize efficient file compositions, multiple file processing techniques, and on-line conversation type retrieval systems.

Efforts must also be made to promote other functions at which the center ought to aim as the nuclear organization of NIST, such as amplifying the referral services and providing consultant services concerning information control systems and documentation techniques.

(3) Amplification of the Surveying and Analysis Functions

It must be possible to carry out comprehensive surveys of trends in science and technology and to compile various publications with analysis and interpretations based on these surveys. The necessary consolidations of the system must be made for this purpose.

It will also be necessary to strengthen the functions for performing surveys of the trends in scientific and technical information activities in foreign countries and surveys of the general trends in the domestic demand for information.

(4) Basic information from sources of information (primary materials) will be obtained, stored and made available for inspection.

In addition, it is also desirable for the center to have the following functions. In the processing of information, there may /12

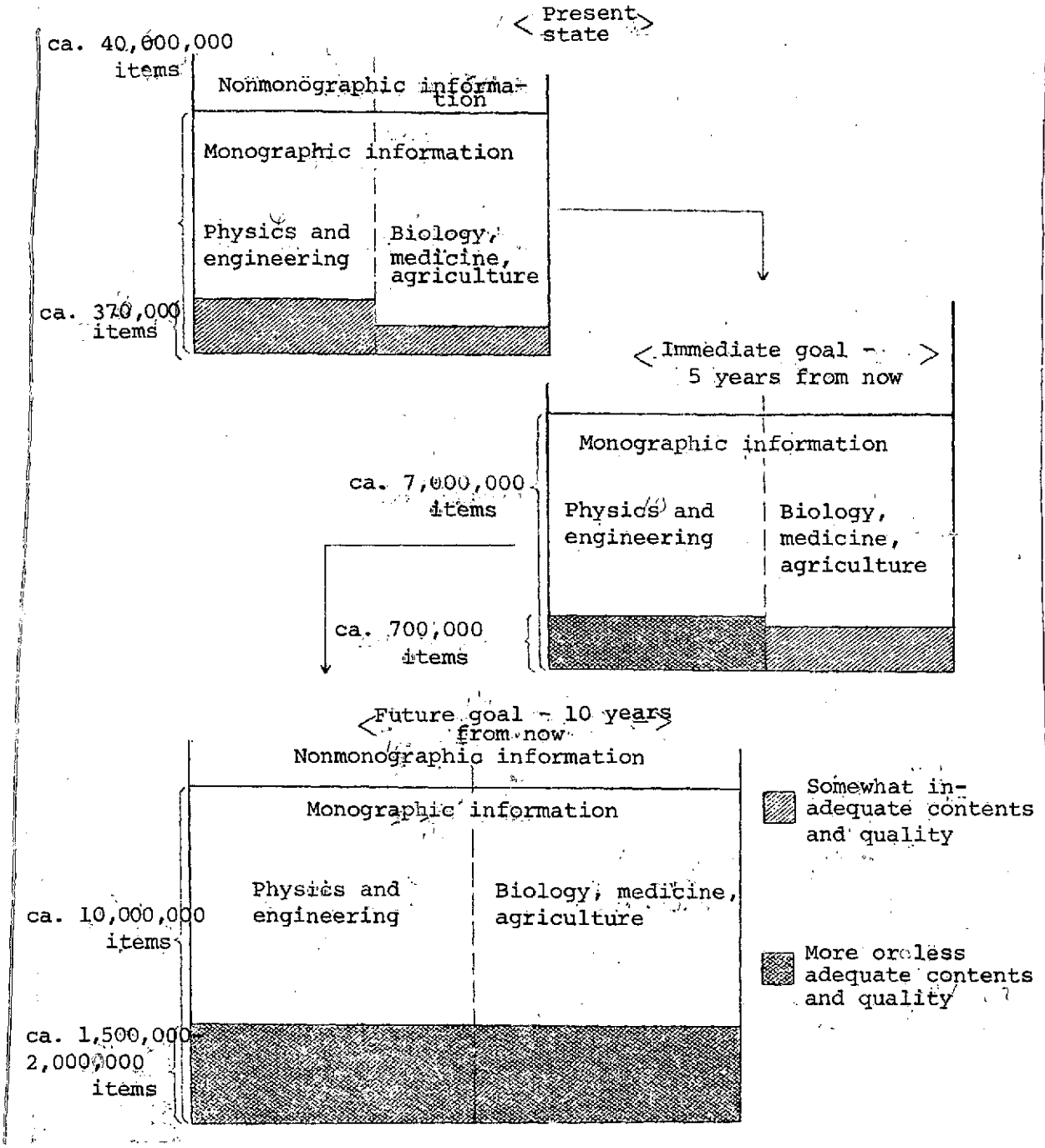


Fig. 2. Present and future state of the integrated center.

arise cases where information from a certain field of science and technology deals with a comprehensive area or with a new area which cannot be handled adequately by the specialized centers. In such

cases, when necessary, the integrated center will supplement the specialized centers so that it will be possible to carry out well-balanced information activities on the whole.

2. Measures for Consolidating the Specialized Centers

(1) Roles and Duties of Specialized Centers

The specialized centers occupy an important position as the basic organizations of NIST. The specialized centers must perform the following roles in accordance with the actual conditions so that it will be possible for them to provide smoothly specialized services for information related to each specialized field.

(1) To collect, as comprehensively as possible, all information connected with the respective specialized fields, and to perform specialized and highly refined information services.

(2) While the integrated center is to provide services for basic information, the specialized centers are to work in close collaboration with the specialists in their respective fields and to meet their specialized needs.

(3) The specialized centers are to back up the integrated center by supplying to it that information from the respective specialized fields which is basic. They are to back up the data centers by providing them with the data required by them.

In order to fulfill these roles, the specialized centers are to carry out mainly the following functions.

(1) To collect and organize information from the respective specialized fields, and to provide services utilizing them such as copying, translation, etc.

(2) To analyze and evaluated the collected and organized information, and to edit periodicals predicting and reviewing trends in the technology. /13

(3) To process the collected and organized information by means of abstracting and indexing, to compile specialized files, as far as possible in a form in which computers can be utilized, and to provide services utilizing them such as retrieval, surveys, and analysis. (Note: The specialized files shall be files containing the bibliographical information, as far as possible abstracts, and key word indexes for the information related to the particular field only.)

(2) How to Consolidate the Specialized Centers

(1) Component Organization of the Specialized Centers

The main duty of the specialized centers is to perform information activities accurately meeting the needs of the specialists in the respective fields. Since many of these information activities have aspects which might be regarded as part of the research and development activities, it is believed to be appropriate for the role of a specialized center engaged chiefly in information activities for a separate field to be played by an organization which is the center for research and development in that relevant field or an organization in which the specialists in the field can participate (such as a scientific society or a special association), so that in its operations the center would be able to maintain constant contacts with the scientists and specialists in the given field and the scientists and specialists themselves would be able to perform some of the information activities.

(2) Measures for Consolidation in Each Specialized Field

In the past, there has never been a clearly systematized classification for scientific and technical activities as a whole. However, for the purpose of consolidating the specialized centers, we shall, for the sake of convenience, use the classifications employed in the Fifth Report of the Council for Science and Technology (April 1971) and classify them as in Table 3.[1] Consolidation will proceed in each case in accordance with the following policy.

Furthermore, one cannot yet say that scientific and technical /14
information activities are, in general, being performed adequately. Therefore, for the time being, first priorities in the consolidation work will be placed on those fields in which the national government will have to take the leadership in consolidation.

In the actual agencies, there will be some specialized centers which will also carry out the activities of data centers. This will be stated in the sections for each of these specialized centers.

(i) Fields Essentially Belonging to the Duties of the National Government

* Environmental Pollution Information

The consolidation of the environmental pollution information system will be promoted centering around the National Institute for Environmental Pollution Research (established in fiscal year 1973).

[1] [Note: No Table 2 in original.]

TABLE 3. POLICIES FOR DEALING WITH CONSOLIDATION OF SPECIALIZED CENTERS

	Responsibility for consolidation	Fields covered	Examples of typical centers
Specialized information	Leadership in consolidation to be taken by national government or by public agencies	① Scientific and technical fields essentially belonging to the duties of the national government, such as environment, disaster prevention, etc.	(Environmental pollution, disaster prevention, urban affairs, etc.)
		② Pioneering fields of science and technology	(Nuclear power, space, oceans, life sciences, etc.)
		③ Scientific and technical fields such as medicine and public healt health for which it would be difficult for the private sector to engage in information activities and in which the national government's role is great	(Medicine, drugs, food additives, and other chemicals, public health, education, etc.)
		④ Scientific and technical fields such as agriculture, forestry, fisheries, and medium and small enterprises for which it would be difficult for the private sector itself to perform information activities	(Agriculture, forestry, fisheries, medium and small enterprises, etc.)
		⑤ Scientific and technical fields such as telecommunications and transportation in which a large role is played by national gov. or public agencies	(Telecommunications, transportation, etc.)
		⑥ Scientific and technical fields which are so fundamental and basic that it would be difficult for private sectors to carry out information activities	(Earth sciences, natural resources, energy, etc.)
	Leadership in consolidation to be taken by private sector	⑦ Field of industrial technology	(Chemistry, iron and steel, patents, etc.)

In fiscal year 1974, the organization of the Environmental Information Section of the National Institute for Environmental Pollution Research, which will be the nucleus of the system, will be consolidated, monographs will be collected, an investigation will be made of the cooperative relations with the International Referral Service (IRS), and some services will be commenced for related governmental agencies.

In the next and succeeding fiscal years, specialized computers will be introduced, air pollution measurement data will be collected and organized, the range of agencies to which information is supplied will be expanded to include local governments and related testing and research agencies, and the organization of an on-line network will be promoted.

* Scientific and Technical Information for Disaster Prevention

A system of liaison and coordination will be established for the purpose of consolidating the information dissemination network which has the National Scientific and Technical Center for Disaster Prevention as its nuclear agency. The collection and organization of materials will be amplified and strengthened, and the smoothness of their dissemination will be promoted. At the same time, work will be pressed forward on consolidating the necessary organizations.

(ii) Pioneering Fields of Science and Technology /16

* Nuclear Power Information

The Japan Atomic Energy Research Institute will exclusively process and disseminate the domestic information conderning nuclear power. Its organization and activities will be amplified, and it will cooperate positively with the International Nuclear Information System (INIS), which is being operated by the International Nuclear Power Agency. The organization of the National Institute of Radiological Sciences will also be amplified so that it can collect, survey, and analyze materials concerning the effects of radiation from the medical viewpoint. These activities will be performed in a form complementing the work of the Japan Atomic Energy Research Institute.

* Space Information

The National Space Development Agency will strengthen its collection and analysis of information connected with space development in order to assist the efficient promotion of work of

development of space. It will also strengthen its exchanges of information with other connected agencies.

In the National Aerospace Laboratory and other related agencies, the work of collecting and organizing materials connected with space science and technology will also be strengthened.

* Ocean Information

For the sake of the smooth and efficient promotion of ocean development, it is necessary to set up a suitable control system for information connected with the ocean, and for this purpose it is first necessary to consolidate the information processing systems consisting of the various observation agencies and to set up a system which would be capable of utilizing the information functionally.

Since the Center for Ocean Science and Technology is the central agency for science and technology having to do with ocean development, it will push forward with activities for collecting, organizing, supplying, and clearing monographs centering around oceanic engineering technology, techology for safeguarding the oceanic environment, and diving technology.

* Life Science Information /17

In the life science field, which covers such a broad range, adequate information controls are especially necessary in order to carry on research accurately. For this reason, following along the lines of the Life Science Research Promotion Center concept based on the Report of the Life Science Advisory Council of the Council for Science and Technology, it is necessary to consolidate the system connected with the collection, analysis, supplying, and servicing of scientific and technical information in this field.

(iii) Scientific and Technical Fields such as Medicine for Which It Would be Difficult for the Private Sector To Engage in Information Activities and in Which the Role To Be Played by the National Government is Great

* Medical Information !

The necessary research and development will be performed for the purpose of consolidating a medical information system which will collect, process, and supply materials and data connected with medicine. Besides, the central and regional medical information organizations will be consolidated, and the formation of a network will be promoted.

For this purpose, the Medical Information System Development Center will be utilized to perform research and development connected with information systems. Concerning medical literature, the resources of the International Medical Information Center will be utilized fully.

* Drug Information

It is necessary to consolidate an information control system which will collect and process rapidly and accurately information concerning the safety of drugs, food additives, agricultural chemicals, and other chemical substances, so that this information can be utilized when necessary in taking the appropriate administrative measures, and so that information concerning their safety can be supplied to medical agencies and prefectural governments.

For this purpose, studies will be made of plans for consolidating this system, and work will be pushed forward to develop the system. Furthermore, the central organization (National Institute of Hygienic Sciences) will be consolidated, and the Food and Drug Safety Center will be strengthened. /18

Concerning drugs, not only is information concerning the safety important; information concerning the efficacy also plays an important role in medicine. Therefore, while the aforementioned medical information system is being consolidated, the Japan Drug Information Center will also be strengthened, and its resources will be utilized.

(iv) Scientific and Technical Fields Such as Agriculture, Forestry, Fisheries, and Medium and Small Enterprise, for Which It Would Be Difficult for the Private Sector Itself to Perform Information Activities

** Agriculture, Forestry, and Fisheries Information

An information dissemination network will be consolidated in order to assist the efficient promotion of testing and research connected with agriculture, forestry, and fisheries and to promote the utilization of the research results. An organization to play the nuclear role in this will be set up in the Tsukuba research and academic city.

During fiscal year 1974, the basic work will be promoted for constituting the agricultural information system, which will collect and organize the monographs, strengthen the secondary information activities, compile the indexing vocabulary for information processing, develop a mechanized retrieval system for

testing and research topics, and microfilm materials. The necessary consolidations will be pushed forward with the target of commencing operations in fiscal year 1976.

The system will also cooperate with the work of the international information system concerning agriculture and agricultural technology (AGRIS) which is being operated by the Food and Agricultural Organization (FAO) of the United Nations. It will assume the responsibility of input into this system.

* Technical Information for Small and Medium Enterprises

A network will be formed centering around the Small and Medium Enterprise Information Center which was established in fiscal year 1973 in the Small Business Promotion Corporation. The Small and Medium Enterprise Information Center will itself collect /19
information intimately connected with medium and small business activities. It will also carry out the work of collecting and processing information generated in the various regions of the country. In addition, it will supply various types of basic information to regional technical information centers and perform clearing services.

(v) Fields Such as Telecommunications in Which a Large Role Is Played by the National Government and Public Agencies in Information Activities

Concerning overall information activities in fields which are highly public in nature, such as telecommunications and transportation, the national government or the public agencies ought to take the lead in surveying the needs and studying the various problems in system consolidation, and the problem of information dissemination ought to be dealt with by them.

In the field of telecommunications, the technical innovations have a rapid speed, and there is an extremely strong demand for smooth dissemination of technical information. Therefore, a survey of the problems connected with the establishing of a specialized center for this field will be carried out.

(vi) Fundamental, Basic Field of Science and Technology

As for the problem of processing and disseminating information in fields such as physics and mathematics which are the basis for research and development in other fields, or in purely scientific fields such as astronomy and earth sciences, part of this will be handled by the integrated center. However, in mathematics and astronomy, the scientific societies and associations are currently engaged in activities consisting chiefly of the processing

and supplying of primary information. For these fields, the scientific societies are to play the central role, as far as this is possible, in promoting and studying information activities. The national government is to provide assistance, whenever necessary, to the scientific societies and associations in strengthening their secondary information activities. In order to promote efficient utilization of information concerning various natural resources such as energy, minerals, water, food, and wood, it is necessary for the national government to play the central role in amplifying and strengthening the activities of the needed specialized centers. /20

(vii) Fields of Industrial Technology

In fields where industrial technology plays the central role, such as assembly technology, fabricating technology, materials technology, patents, standards, etc., most of the demand for information comes from private enterprise. In some of these areas the activities can be carried forward independently by the private sector to a certain degree. Therefore, fundamentally the private sector is to play the leading role in moving forward with consolidation.

However, in these cases the information activities are carried out chiefly by the industrial and scientific associations, and the current activities are those centering in primary information. Therefore, in many of these cases there is only a weak base for raising the information activities to a higher level.

For this reason, the national government is to play a guiding role to encourage the private sector to raise its information activities to a higher level. It is to take suitable measures for assistance, such as financial grants, to engage in research and development in order to promote smoother information activities, and to engage in basic activities such as compiling and popularizing standards for information dissemination techniques. When necessary, it will also assist the activities on a business basis such as processing information through the integrated center or exchanging personnel.

* Patent Information

Patent information has an important value as information in industrial technology. The chief role in the activities in this field is played by the Japan Patent Information Center. The Japan Patent Information Center is engaged in the work of publishing, indexing, and abstracting periodicals, providing retrieval services of bibliographical data using electronic computers (first retrieval system service), and also providing patent information retrieval

services from the technical contents (second retrieval system service). It is also cooperating on a work-sharing basis with the work of international exchanges of patent information through the International Patent Information Center (INPADOC). /21

It will be necessary for the national government to continue in the future to take suitable measures of assistance, such as financial grants, to promote expansion of the fields covered by the second retrieval system service and the strengthening of its functions.

3. Measures for Consolidating the Data Centers

(1) Roles and Duties

The numerical data having to do with science and technology, either alone or in combination with monographic or other information, have an important significance as the basis for scientific and technical activities such as research and development. For this reason, it is desired to consolidate a system which will collect and process the relevant data in each field and supply it in a way in which the output can be generally utilized. Furthermore, a high degree of specialized knowledge is necessary to select the data accurately, and this activity in itself is also essentially a scientific activity. During the process of choosing and selecting large amounts of data, there have often been cases when new laws and systems have been derived. However, in this country, even though data processing activities require large amounts of manpower and research time, they have not been regarded as research or technological development, and the evaluation of them has not always been high. For this reason, in the past, these activities have only been carried out spontaneously and separately for some fields at national and public testing and research agencies, or in the research laboratories of universities.

In the future, this country also will need to promote data processing activities in various fields, as well as to systematize them and nurture them from a comprehensive standpoint.

With this basic concept at the background, the data centers engaged mainly in these activities will fulfill the role of collecting various types of numerical data, processing them, and supplying them to the information dissemination channels. /22

In order to fulfill this role, the data centers will:

(1) collect published or unpublished data or compilations of data for specific fields.

(2) organize the collected data, study their contents, and make choices and selections. When necessary, the data will be examined by means of follow-up testing or supplementary testing.

(3) perform data clearing services for the collected and organized data, and provide services such as copying and supplying.

(4) compile and publish standard data books based on the data which have been selected, analyzed, and evaluated.

(5) cooperate with data exchange services and data collecting and distributing services performed by relevant overseas agencies or international agencies supplying domestic data to them or supplying overseas data to domestic users.

(2) Consolidation Procedure

(1) Component Organizations of the Data Centers

The conditions which the data centers should fulfill are the following.

(i) They must be sufficiently able to secure persons having a high level of knowledge concerning the given field and concerning information processing.

(ii) They must be organizations able to form an organic network concerning the collection of information with the various testing and research agencies which are the information sources in the given field.

(iii) In those fields which require testing to study the evaluation methods, the establishment of most accurate values through follow-up testing, or testing to make up for missing data, they must have suitable research facilities and measuring equipment, etc.

(iv) They must be able to provide services utilizing the accumulated data and must be provided with functions such as question-and-answer services to the users, survey services, retrieval services, copying and supplying services. /23

(v) They must be capable of engaging in international exchange and collaborative activities such as formulating systems for exchanging or publishing data and patterns for evaluating data and international work-sharing and collaboration on definite topics of center activities.

In order for the data centers to fulfill these conditions and to carry out their center duties efficiently, it is believed suitable that these functions should be carried out chiefly by those organizations which are actually performing the research and development or surveys and observations in accordance with the research and development goals or projects of each specific field of science and technology.

(2) Measures for Consolidation in Each Specialized Field

On the basis of the aforementioned conditions, the most suitable place for fostering the data processing activities ought to be selected for each specific field from among the testing and research agencies, scientific societies and associations, and universities, weighing in the choice their previous record of achievement and their personnel. In cases where activities have been carried out in the past officially or unofficially in separate fields of organizations, the system is to be consolidated in the direction of supporting these activities and of gradually strengthening them.

In some of the fields of natural observations, a global network is projected by the International Council of Learned Societies (ICSU), and there are some domestic organizations which have already embarked on contacts and coordination with related overseas organizations concerning said data. In these cases, it will be necessary to consolidate in a manner which will amplify these functions and enable them to carry out their service activities more smoothly as public data centers. /24

Data activities, basically, are conceivable for all specialized fields, but in the consolidation of NIST it is considered appropriate to move forward with their consolidation on the basis of the classification in Table 4.

(i) Data from Natural Observations

In view of the public character and the purely academic nature of data processing activities in this field, it would be suitable to develop them as part of the investigatory and research activities in the national and public investigatory and observatory organs or of the investigatory and research activities in universities. Example of what are believed to be the main activities are shown in Table 5.

In this field especially, it is not enough to merely designate the responsible agencies and to consolidate them. It will also be necessary to combine this with positive efforts aimed at amplification of the observation networks, consolidation of the data collecting-processing networks, and external cooperation.

In future consolidation work, in addition to gradually fulfilling the conditions for data centers in each of the responsible agencies, it will also be necessary to take the following into account.

(1) There are strong demands for utilizing data concerning weather conditions, earthquakes, etc., not only from specialists in these fields alone, but also from a broad range of other fields as well.

TABLE 4. POLICY FOR CLASSIFYING DATA AND CONSOLIDATING DATA CENTERS

	Classification of data	Fields covered	Methods of consolidation	Examples
Numerical data	Data from natural observations	Fields of natural observation such as astronomy, weather conditions, earth conditions, water conditions, ocean conditions, and natural environment (Data pertaining to nature and which basically lack reproducibility)	To be developed chiefly as part of the activities of national or public investigating and observatory organs or universities	Cosmic rays, ionosphere, earthquakes, oceanographic observations, etc.
	Data on properties of matter	Fields having to do with the physical and chemical properties of matter (Data concerning the properties of matter organized in terms of constants, qualitative properties, etc.)	To be developed chiefly as part of the activities of national or public testing and research organs, universities, or scientific societies and associations.	Thermodynamic properties, physical spectra, etc.
	Biological data	Fields such as medicine and agriculture	To be developed chiefly as part of the activities of national or public testing and research organs or scientific societies and organizations or as part of the activities of specialized centers	Life sciences, medicine, agriculture, etc.

(Continued on following page)

Table 4, continued

	Classification of data	Fields covered	Methods of consolidation	Examples
Numerical data	Engineering data	The field of engineering, such as performance properties of articles and equipment, analysis, test standards, etc.	In some cases scientific societies and associations or private agencies may play the chief role in the activities, but to be developed chiefly as part of the activities of national or public testing and research organs (except for the information treated as knowhow).	Materials testing, engineering standard values, etc.
	Other data	Data from surveys of disasters, survey of accidents, etc.; fundamental data of the natural sciences; or other data which are used in combination with the preceding	To be handled suitable in accordance with the actual conditions	

TABLE 5. MAIN DATA CENTER ACTIVITES IN NATURAL OBSERVATIONS /26

Classifications	Responsible agencies	Remarks
Astronomy	Tokyo Astronomical Observatory	
Cosmic Rays	Institute of Physical and Chemical Research	
Ionosphere	Radio Research Laboratory	
High altitude physics, weather conditions	Meteorological Agency	
Latitude and longitude	Latitude Observatory	
Topography and cartography	National Land and Geographical Authority	
Geology	Geological Survey Bureau	
Volcanism	Meteorological Agency	
Polar regions	National Polar Research Institute	
Oceans	Oceans Materials Center, Maritime Safety Agency	Includes gravity, submarine topography and geology, terrestrial magnetism, pollution and biology concerned with oceans
Very strong earthquakes	National Scientific and Technical Center for Disaster Prevention	
Earthquakes	Meteorological Agency, etc.	
Earth observations (IGY)	Secretariat, Science Council of Japan	

(ii) The data concerning environmental pollution, disaster prevention, etc. are found not only in the central processing agency, but are also dispersed in a number of other agencies,

which each have their own particular purposes. Therefore, there is a need for concentration and clearing of these data.

(iii) In earth observation data, there is a tendency for the collecting and disseminating networks to be formed under the appropriate responsible agencies for each separate research and observation topic. However, since this type of data activity essentially ought to be a unified work, it is desired for a concentrated service agency to exist so as to cover all the topics.

Since these various problems exist in actuality, it will be necessary for the separate responsible agencies to confer with each other and to take measures in order to consolidate a system which will make it possible to form the data base and consolidate the dissemination network efficiently.

(ii) Data on Properties of Matter /27

Data concerning the physical and chemical properties of matter basically have an extremely high importance in all fields of science and technology. Nevertheless, because of the large amounts of manpower required in their collection, analysis, and evaluation, systematic processing activities have not been performed in this country in the past, and the activities have only been performed on a small scale and in scattered locations by a few researchers.

In the future, it will be desirable for organized activities to be developed centering around national and public testing and research organs, universities, and scientific societies and associations, but it is necessary for the national government to take measures contributing to the strengthening of the base for such activities. The chief activities concerning properties of matter which are going on in this country at the present time are as shown in Table 6.

Furthermore, in the processing of data concerning the properties of matter, input of specialized knowledge of specialists in various mutually connected fields is necessary in the work of evaluation. In addition, since a considerable amount of the data on properties of matter are used in different fields in ways which are interrelated, it is believed that it would be efficacious from an overall viewpoint, made in various data activities in the future, to develop a data processing system embracing a broad range of fields connected with the properties of matter and to consolidate a central data bank to serve as a nucleus.

TABLE 6. MAIN DATA CENTER ACTIVITIES CONCERNING PROPERTIES OF MATTER /28

Classification	Responsible organizations	Remarks
High-pressure data	Society of Materials Science, Japan High Pressure Subcommittee	Commissioned by Science and Technology Agency
Nuclear magnetic resonance	Chemical Society of Japan	" " " "
Raman spectra	Japanese Society for Analytical Chemistry	" " " "
Infrared absorption spectra	Infrared Data Committee	
Gas chromatography data	Gas Chromatography Data Committee	
Steam tables	Keio University	
Nuclear data	Japan Atomic Energy Research Institute	

(iii) Biological Data

Biological data are chiefly data having to do with fields such as biology, medicine, and agriculture.

Although new plans are now being studied concerning medical information, the data activities in these fields at the present stage are not very advanced in general. This is because there was little accumulation of numerical data in the past and because even those data which were in existence were not generally disseminated. However, in view of the increases in the amounts of the relevant data accompanying the recent advances in medical techniques, the promotion of research concerning the environment and prevention of environmental pollution, and the advances made in research in the life sciences, there have been increased needs to utilize these accumulated data. In view of this, it is necessary, while consolidating the activities of the specialized centers, to strengthen the base for promoting data activities in these fields in the national and public testing and research agencies, the relevant scientific societies and associations, and other related organizations.

(iv) Engineering Data /29

Engineering data have to do with materials for parts, performance properties of equipment, etc., analysis, testing, standards, and so forth. In these data, not only is the individuality of each item of importance, but the reproducibility is also important.

For this reason, in many cases it will be necessary to perform follow-up tests and complementary experiments to obtain basic data, while also performing materials testing and other engineering testing to inspect individual items. Thus, when consolidating the data center for this field, studies will also have to be made about consolidating the facilities for these purposes or consolidating a system for utilizing them.

Among the users of the data center in this field, besides national and public testing and research organs and universities, private enterprises also will have a considerable weight. Thus, it would be conceivable for the private sector to play the main role in consolidating the data center activities. Nevertheless, since in most cases there are strong requirements concerning the objectivity and reliability of the data in this field, it is thought that it would be suitable for national and public specialized agencies to assume the central role in succession as required by the needs and to promote the activities.

The following are fields in which it is believed that data activities will be anticipated in the future:

a) data on strength of material (metals, etc.)
b) data on quality of materials (inorganic materials, etc.)
c) reliability data.

4. Measures for Consolidating the Regional Service Centers /30

(1) Roles and Duties of Regional Services Centers

The regional service centers perform important roles in the information supplying services in NIST and in promoting the dissemination of the information activities. When they are consolidated, considerations must be incorporated which will make it possible to eliminate regional imbalances in the dissemination of information.

For this reason, the regional service centers, as the central organs playing the nuclear role in information dissemination activities within each region will play the following roles.

(1) Information which has been processed by the integrated center, the specialized centers, the data centers, and the clearing organizations will be made available to the information users either directly or via a terminal.

(2) Information files with regional characteristics corresponding to the demand for information in each region will be maintained, and the information users in the given region will be given services corresponding to their demands for information.

(3) Dissemination of information activities will be promoted among the information users in each region.

In order to carry out these roles, the regional service centers will perform the following duties:

(1) to collect the primary information which will be needed in the given region as well as the secondary information prepared by the integrated center, the specialized centers, and the data centers, to organize it, and to make it available for services such as inspection and copying;

(2) to receive requests for information from information users in the given region and perform services such as retrieval and surveys, either using the information files possessed by the regional service center itself or using the integrated center, the specialized centers, the data centers, the clearing organizations, or other organizations; /31

(3) to obtain a grasp of the actual demand for information on the part of the groups of information users in the given region, to feed this back to the integrated center, the specialized centers, and the data centers, and to provide the information users with advice and guidance aimed at improving their knowledge about information utilization and at dissemination.

(2) Consolidation Procedures for the Regional Service Centers

There are three possible types of regional service centers with respect to the range covered by the centers, depending upon the geographical and administrative relationships or the conditions of industrial location and means of communication. They are: units consisting of a block embracing several local governments (broad administrative zone); units consisting of a single local government (a prefecture, etc.); and units consisting of a specific area requiring information activity.

(1) Regional Service Centers for Block Units

Regional service centers for block units are to be consolidated for the main purpose of disseminating information processed by the integrated center or specialized centers among users in a regional block in which there are well developed terminal organs. Since the regional service center for a block unit will embrace a number of local governments in carrying out its information activities, it is necessary for the national government to play the leading role in consolidating it. Theprocedure will be to divide the entire country into approximately ten regional blocks and to provide one center in each block. In this case, it will be desirable to move ahead with consolidation in gradual steps, taking into consideration the trends in the demand for information in each regional block and the regional imbalances.

The branch offices of the Japan Information Center of Science and Technology (currently four offices in Osaka, Nagoya, Kyushu, and Chugoku) ought to carry out the functions of these regional service centers for block units, and they ought to be expanded in the future. /32

(2) Regional Service Centers for Units of Local Governments

It is believed that the regional service centers for units consisting of a single local government will not confine themselves to merely providing information and materials to the medium and small enterprises and persons engaged in agriculture, forestry, and fisheries in each given region, but will in most cases provide services inaa form where they will be consolidated with the entities working to provide business guidance to them or to disseminate technology among them.

Since these regional service centers will be limited to a single local government as their unit, it is desirable for the local government itself to play the leading role in carrying forward their consolidation. However, since in many cases they will be responsible for information services which are closely connected with the policies of the national government, in consolidating them it will be necessary to consider the provision of assistance from the national government. At the same time, it will be necessary to go forward with the strengthening of public testing and research organs which are capable of offering technical guidance and of the information-related departments of the various organizations which can establish close relations of cooperation with them, and to form a network which will be capable of providing effective services.

Concretely, this will involve the following:

(i) Concerning small and medium enterprises, technical information centers will be provided in the industrial laboratories operated by the local governments. These will be expanded and strengthened to form a service network centering around the Medium and Small Enterprise Information Center established in the Small Business Promotion Corporation.

(ii) Concerning agriculture, forestry, and fisheries, the central organ will be established in the Tsukuba research and academic city, and a service network reaching down as far as the public testing and research agencies will be consolidated while maintaining liaison with the national testing and research agencies in the region. /33

(iii) In the medical field and in fields handling drugs and other chemical substances, central organs will be established for each, and a rational service network will be formed connecting them with the health offices and the public health laboratories.

(iv) Concerning environmental pollution, a network will be formed centering around the Environmental Information Department of the National Institute for Environmental Pollution Research and connected with the local governments.

(3) Regional Service Centers for Units of Specific Areas

Regional service centers for units of specific areas are centers which provide services for areas in which there are large-scale concentrations of producers or users of information, such as research and academic cities or industrial regions.

The methods of consolidating the regional service centers in these specific areas will differ depending upon the status of each of the component regional groups requiring information activities. For example, in cities consisting chiefly of testing and research organs of the national government, such as the Tsukuba research and academic city, the national government will play the central role, while in industrial regions it would be suitable for the private sector to play the central role in carrying forward the consolidation.

In the Tsukuba research and academic city, there will be established a "Research Exchange Center" (tentative appellation) as the nucleus for information activities in this city. Thus, the information services for researchers will be expanded centering around this center, and its functions of introducing the results of research performed in this city to users both inside and outside the city will also be expanded.

5. Measures for Consolidating the Clearing Organization /34

(1) Duties and Their Nature

The purpose of the clearing organization is to provide users with comprehensive information about methods of obtaining the necessary information.

The chief duties of the clearing organization are:

(1) to collect information concerning research and development activities (active organs, research items and their contents, researchers) in a broad range of fields of science and technology, to process the information, and then provide the output.

(2) Referral to information agencies (information services agencies, information systems, etc.)

(3) notification and provision of documents and other materials (minutes of meetings, etc.) which are difficult to obtain and of documents generated by government-affiliated testing and research agencies

(4) Cooperation in contacting overseas clearing organizations and other information agencies.

Consequently, the following may be mentioned as its properties:

(1) It is necessary for a network to be formed centering around this organization and connected with the related agencies. In NIST, it must be assigned the position of a basic organization.

(2) It will not compete with the various type of information dissemination systems connected with science and technology, but will play a supplementary role when viewed from the standpoint of NIST as a whole. Both are equally indispensable for NIST.

(3) Its public nature is highly developed, and it would be difficult to operate it privately on an economical basis.

Because of the nature of its duties, the clearing organization is also extremely important in international exchanges (collaboration with overseas information agencies, international exchange of information). /35

(2) How to Consolidate

There are various different levels in clearing activities. As the separate subsystems in NIST are formed, there will be a tendency for priority to be placed on clearing activities (agricultural

and environmental fields), and there are many areas which will be further expected in the future. It is expected that the various component organizations of NIST will make positive efforts to promote them.

As these activities are pushed forward on a comprehensive basis, in a system such as NIST which embraces a variety of information providing organs with different fields and organizations and which is required to have an organic unity of operations as a whole, it is regarded as necessary to consolidate a comprehensive clearing organ which will serve as the nucleus for network formation. For this reason, it is desirable either to provide these functions concurrently in the integrated center, which is already carrying out some of these duties, or to set up a new organ, in order to contribute to the formation of the clearing network of NIST as a whole.

6. Measures for Consolidating the Central Depository

(1) Basic Ideas

Basically a depository is an agency which has the duty of collecting and preserving all monographs produced by various testing and research organizations in order to provide users reliably with the information which they require. Therefore, in order to raise the level of the dissemination of information, primary importance must be attached to the amplification and utilization of its functions. /36

Since the various types of centers in NIST collect, process, preserve, and supply information from their respective fields, they have these functions to a certain extent. However, some of the information collected or processed by the various types of centers requires preservation over prolonged periods, and the centers are unable to do this. A central depository is necessary in order to preserve such information.

In such a case, the central depository will naturally provide information about the information accumulated in it, and it will be necessary to consolidate its functions so that it will be possible to easily retrieve any information needed by users.

(2) Consolidation Procedures

Information published not too long before and which is used with a certain degree of frequency will be stored in the various types of centers as necessary. In such cases, it will be necessary for the location of the information in question to be made clear so that the users can easily gain access to it. It is desired that

a central depository should be consolidated in order to store these original materials or copies of the information which it would be difficult for these agencies to store because of the rapid increase in the amount of information. On account of the comprehensiveness of such a central depository, it would be practical to combine it with the integrated center.

In consolidating the depository functions, it will be necessary to maintain close collaboration, while eliminating unnecessary duplication of the stored information, between the various centers mutually and also between the centers and the central depository. It would be desirable for studies to be made in a definite sequence /37 at the central coordinating organization about the concrete future measures concerning this point.

7. Measures for Consolidating the Other Organizations

(1) Organization for Personnel Training and Organization for Research and Development

Concerning these component organizations which make up the base of the NIST, it is believed necessary to consolidate the organizations which fundamentally carry out these duties. The procedures for consolidating them will be described in the section on the training and securing of personnel and on research and development.

(2) Terminals

The "window" agencies for directly serving the users, which may be located in public libraries or in organizations to which the information users are affiliated, such as universities, testing and research agencies, or enterprises, generally have the functions of terminals. When consolidating NIST, it will naturally be necessary to consolidate the various centers, but the functions of the terminals are also extremely important, and it is believed that it will be necessary to make studies of their networking.

(3) Libraries

Guidance to materials by subject, guidance to the location of materials, and searching services for bibliographic details, together with storage of materials and making them available to the readers, have been provided in the past as important parts of the reference activities of libraries. These reference functions also play an important part in NIST, in which the main dissemination /38 medium is secondary information. If the reference functions of the science and technology departments of the National Diet Library,

university libraries, and special libraries were to be utilized in a positive manner on the basis of the secondary information retrieved and provided through the integrated center and specialized centers, it would be possible to have rapid and accurate access to the primary information sought by the users.

In view of this, it is necessary for libraries, the integrated center, the specialized centers, and the other NIST-connected agencies to rapidly complete catalogs of the materials in their holdings. The government must compile files of the holdings of the Japanese and foreign books and periodicals in each of the locations (union catalog), and NIST must complete a union catalog which can be used at NIST. In this way, it is necessary to promote the operation of a highly developed scientific and technical information dissemination system in which primary information services and secondary information services will be unified.

While striving, through the above means, to amplify and strengthen the operations by expanding the scope of the materials collected and promoting interlibrary loans between the libraries to which the users and the various information agencies have access, it is also regarded as important to strengthen and consolidate the system so that it will be able to respond positively to services such as making materials available to readers and copying them.

Section 2. Measures for Promoting Work-Sharing and Cooperation in NIST /39

As a system making possible the nationwide dissemination of the entire range of scientific and technical information, NIST ought to be perfected as a unified system making possible user-oriented services, while giving full emphasis to the purposes and distinctive features of each of the component agencies and functions, and while also taking into consideration the overall coordination of the whole.

It is indispensable for this purpose to establish systems of work-sharing and mutual cooperation among the component organizations making up NIST. In the following, let us summarize the procedures for consolidating these systems of work-sharing and cooperation.

1. Relationships between Integrated Center and Specialized Centers

Since the integrated center and the specialized centers are organs for processing monographic information, it is probable that there will be some duplications between them.

Therefore, it is necessary to establish the following work-sharing and cooperative relationships concerning the materials to be processed by each.

(1) The basic information files are to be compiled with mutual cooperation. That is, the integrated center itself will perform such processing as abstracting, while the [basic information] processed by the specialized centers will be supplied to the integrated center.

(2) The specialized information files are to be compiled with mutual cooperation. That is, the specialized centers will themselves perform the processing such as abstracting, while any basic information dealing with the given field will be supplied from the integrated center, and parts of the files of any other specialized centers which may be usable will be supplied.

(3) In order to make this type of mutual cooperation possible, it is desirable for these agencies to standardize their systems of information processing as far as possible. /40

It is also conceivable that these agencies might share the work for a number of processes including collecting, processing, and supplying. (For example, in chemistry there might be cooperation between the Japan Information Center of Science and Technology and the Chemical Information Council, or in medicine it might be between the Japan Information Center of Science and Technology and the International Medical Information Center, and so forth.)

On the other hand, it would be necessary to establish a cooperative system in various forms, so that these agencies would collaborate in their operations so that a user could be serviced no matter which agency he happened to visit, or so that the agencies would provide each other with electronic computers and other equipment or services.

2. Relationships Between Data Center and Other Agencies

The organization, analysis, and evaluation of numerical data differs from the processing and preparation of monographic information in the contents of the operations involved and in the type of specialized knowledge which is needed.

That is, since it is nearly impossible to collect the numerical data for an entire field comprehensively and exclusively, and since there would hardly be any advantages at all in editing them in comprehensive form, there would be little meaning in processing them at the integrated center. However, at a specialized center functioning in close connection with specialists, it would

be possible to engage in activities in evaluating and collecting numerical data as a part of the research activities. From this standpoint and also from the viewpoint of utilizing the cooperative relationship with the related researchers, it is believed that there would also be many occasions for combining these activities with the data center activities.

Even though the processing methods are different for monographs and for data, it is believed necessary to establish a system of cooperation in various forms between the integrated center, the specialized centers, and the data centers. This could involve exchanging necessary materials, collaborating in connection /41
with the services, and making joint use of electronic computers and other facilities and equipment.

It will also be necessary for the data centers to establish relationships of mutual cooperation with the relevant universities, testing and research agencies, and scientific associations and societies. This could involve exchanging data, requesting corroboratory testing, or utilizing the testing facilities.

3. Cooperative Relationships Between Regional Service Centers Other Agencies

Basically, the cooperative relationships between the regional service centers and other agencies are thought to be as shown in Table 7.

In the future, when economical means of transmitting information are developed or in cases when some regional service centers have large amounts of information to transmit, it may become necessary for the integrated center to collect the information from the specialized centers and to establish communication channels linking the integrated center and the given regional service centers.

Section 3. Private Sector Activities in NIST and Measures for Fostering Them /43

1. Basic Ideas on Promotion of Private Sector Activities

Activities of the private sector (scientific associations and societies, industrial organizations, etc.) occupy a great specific weight in the processing and dissemination of information in NIST.

In those fields, such as industrial activities, where the main role is played by activities in the private sector when viewed from the nationwide standpoint, it is considered to be desirable for the private sector to play the leading role also in the information activities.

TABLE 7. COOPERATIVE RELATIONSHIP BETWEEN REGIONAL SERVICE CENTERS AND OTHER AGENCIES

	Partner agencies	Mutual cooperative relationships centering around regional center
Central agencies	Clearing organization	Preparing and sending survey sheets, receiving directories
	Integrated center	① Receiving abstracts, requesting surveys, etc. ② Obtaining technical guidance, requesting training of employees ③ To be connected by on-line system in the future
	Specialized center	① Receiving abstracts, requesting surveys, etc., receiving technical guidance ② Receiving edited information concerning specific fields, receiving assistance in activities (example: medium and small enterprises, agriculture, forestry, fisheries)
	National Diet Library	Receiving periodical distribution of primary materials at the designation of the Scientific and Technical Materials Library
Regional agencies	Terminal	Obtaining cooperation in grasping the demand, providing materials or technical guidance
	University testing or research agency	Receiving cooperation in order to cope with specialized demands
	Various libraries	Utilizing the materials

However, there are differences in levels in these activities as well, and there are some agencies which are capable of fulfilling the functions of specialized centers. On the other hand, there are many cases where there are difficulties in establishing new agencies or in strengthening existing ones, in spite of the necessity, because scientific and technical information activities are not necessarily connected with profit.

Therefore, it would be desirable, when necessary, for the national government to take positive steps to assist such private-sector activities and to promote them so that NIST will be able to function as a well-balanced, unified system.

2. Anticipated Measures for Promoting Them

(1) Consolidation and Strengthening of the Relevant Agencies

(1) Scientific Associations and Societies

The majority of the specialists engaged in scientific and technical activities in each field participate in scientific associations and societies, which have in the past provided the information generated to the specialized circles in the given field. In the future, it will be necessary for the researchers and specialists in each given field to play the central role in promoting smoother and more highly sophisticated information activities so that it will be possible to cope accurately with the diversified requirements for information from their members.

From this viewpoint, it is expected that the scientific associations and societies will consolidate their system in information activities as far as possible as the specialized centers or data centers in NIST, or as the major cooperating agencies with them. /44

(2) Industrial Organizations

In every field of industrial technology, including assembly technology, fabrication technology, and materials technology, private enterprises occupy a high percentage of the demand for information. Therefore, their industrial associations ought, basically, to carry out activities as specialized centers or data centers.

In some of these fields, such as chemistry and iron and steel, information center type activities are already being carried out to a certain extent, and there are other areas where activities are beginning to be pushed forward in this direction. However, as a whole they are still on an insufficient level from the standpoint of increasing the quality of information activities, and it is

necessary to move ahead with the organization of work-sharing and cooperation in information processing in each field and also to consolidate the foundation for raising the efficiency of the information activities. The consolidation of the base for utilizing patent information forms a part of the work of patent administration, and in this field it will be necessary for the national government and the private sector to continue to cooperate in promoting utilization of the information, primarily by strengthening and fostering the Japan Patent Information Center.

(2) Consolidation of Work-Sharing and Cooperative Relationships

While facilitating the establishment of the base for consolidation in the various fields as mentioned above, in order to promote organic collaboration of NIST as a whole, studies will be necessary concerning coordination of the work-sharing and cooperation between the integrated center and each of the specialized centers and concerning organization of information activities within each of the fields. /45

A suitable method for accomplishing this would be, for the time being, to perform case studies among the fields and agencies which are carrying out information center type activities, and to apply the results to actual practice.

On the basis of the results of these studies, the necessary steps ought to be taken to make sure that the agencies connected with the private sector can function sufficiently within NIST.

3. Measures To Be Taken by the National Government

(1) Overall Coordination of NIST Operation

The work-sharing and cooperative relationships between the relevant organizations in NIST such as the specialized centers and data centers, as well as the measures necessary to enable these organizations to function adequately, must be studied in the central coordinating organization which is responsible for comprehensive coordination of NIST as a whole from a comprehensive and fundamental viewpoint, with central emphasis being placed on measures for fostering these relationships.

In order to contribute to the deliberations, it is thought that the state of the activities of these agencies and their business plans ought to be surveyed when necessary in order to obtain an adequate grasp of the actual situation.

(2) Assistance Measures in NIST

(1) In large-scale national development projects, the response to the problem of environmental pollution, and other fields where the national government has a large role to play, emphasis is also placed on the collection and processing of information, and work is being done in consolidating the organization. On the other hand, in promoting information activities in scientific associations and societies in the private sector, there are many cases where it is difficult to invest sufficient manpower and funds. Therefore, /46 the national government must strengthen the basic activities of research and development and training of personnel, while at the same time take some sort of measures in the way of assisting the independent information activities of the private sector.

(2) Since the results obtained by the consolidation of the base of NIST, such as research and development or the training of personnel, will also make a big contribution towards smoother information activities in the private sector as well, it is necessary for the national government also to make positive efforts towards consolidation.

(3) On the other hand, it is possible to use systems such as financial grants and the commissioning of business surveys as concrete methods for assisting independent information activities in the private sector.

Such assistance from the national government ought basically to be spread out broadly over the various fields, but for the time being it will be given in definite sequence on the basis of studies of the public interest, the urgency, and the relationship between the expense and the effects.

The main modes of concrete assistance for expediting smoother activities in the private sector would be: making surveys of the demand in a definite field of science or technology, system analysis and system design, promotion of secondary information activities, assistance for equipment, etc., and research and development. These types of assistance would be aimed at consolidating the base of NIST in order to contribute to smoother activities in the private sector. At the same time, it is considered likely that in giving assistance a main priority will be placed on activities on the business level such as processing of information or training of personnel.

Section 4. Measures for Promoting International Cooperation /47

1. Basic Ideas on International Cooperation

Since scientific and technical information essentially has an international nature, it is desirable for activities in

disseminating it to be carried forward positively from an international standpoint. Especially in recent years there have been remarkable increases in the amounts of scientific and technical information generated in the world, and it has become impossible in actual fact for a single country to collect all the information comprehensively and to convert it into secondary information. For this reason, it is thought that international division of labor and cooperation will become increasingly important in the future.

Particularly in a country like ours, which is linguistically isolated from other countries, the national government must make thorough studies about the manner in which we deal with international cooperation.

2. Modes and Current State of International Cooperation

There are three modes of relating to scientific and technical information activities overseas. They are: (1) international agencies connected with information activities; (2) international systems of dissemination of scientific and technical information carried out through international agencies (or conferences); and (3) information dissemination systems (or information agencies) of a specific country. If we classify these from the standpoint of international cooperation, the first two will correspond to multinational cooperation, and the third will correspond to cooperation between two countries.

Among the international agencies which are currently dealing with scientific and technical information policy or with general matters having to do with information, there are: the Committee on Scientific and Technical Policy of the OECD (CSTP, and its subsidiary organizations, IPG and CUG); the International Council of Learned Societies (ICSU); the International Documentation Federation (FID); and the International Standardization Organization (ISO). This country is participating positively in the relevant organizations.

As for the international system of information dissemination, /48
there are UNISIST (World Scientific Information System), AGRIS (International Information System on Agriculture and Agricultural Technology, INIS (International Nuclear Information Service), and INPADOC (International Patent Information Center). The number of these will tend to increase further in the future.

Among the information dissemination systems of specific countries, there are the system for analysis and retrieval of medical literature (MEDLARS), the Chemical Abstracts Service (CAS), the information service for physics, electricity, and control engineering (INSPEC), and the Educational Resources Information Center (ERIC). Among those with which this country currently has

cooperative relationships, there are MEDLARS, in which the International Medical Information Center is in charge of the input and the Japan Information Center of Science and Technology is in charge of the output, and MARC, in which the National Diet Library receives donations from the United States Library of Congress. In addition, there are cases, such as CAS, in which related agencies in this country purchase the output and supply it to users in this country.

3. Patterns of International Cooperation in NIST

In view of the importance and the trends in international cooperation in the dissemination of scientific and technical information, it will be necessary for NIST, the nationwide dissemination system for scientific and technical information in this country, to make sufficient studies of its response to questions of international cooperation.

(1) International Agencies Connected with Information Activity

Since the duties which an international agency ought to fulfill include the exchange of opinions concerning scientific and technical information policies between the member nations, contributing to the improvement of the general level of information activities as a whole, studying basic, common problems for expediting the smooth international dissemination of scientific and technical information, and, when necessary, the obtaining of agreements between the countries concerned, it is necessary for our country also to coordinate the opinions of the domestic agencies concerned, to push forward smoothly with business aimed at international cooperation, and to make it possible for us to participate positively in it. /49

(2) International Systems for Dissemination of Scientific and Technical Information

International systems are necessary in view of the fact that it would be difficult for a single country alone to collect comprehensively all the information generated in the entire world and to convert it into secondary information. Furthermore, if one considers that, by providing domestic information, it becomes possible to obtain information from the entire world, the advantages to our country would appear to be great. Therefore, it is necessary for NIST to participate positively in international systems and to promote more efficient information dissemination activities.

(3) Systems of Agencies of Specific Countries for Scientific and Technical Information

At the present time, there are many information agencies in countries all over the world, and each one of them is contributing to the domestic dissemination of information within its country. Some of them are entering the international scene in a positive manner against the background of the domestic information dissemination systems within their own countries.

As NIST expands its various types of files, there will be many areas in which it would be efficacious for it to utilize these overseas files. Therefore, adequate measures for dealing with their introduction must be studied.

However, there are various type of input-output relationships with respect to information systems or information agencies of the specific countries. In some cases a give-and-take system is practiced in which output is received in exchange for input. In other cases, the output is purchased. Therefore, in considering NIST's measures of dealing with the introduction of overseas files, studies will have to be based on the current situation and on forecasts of the future trends. /50

Therefore, when moving ahead with international cooperation concerning dissemination of scientific and technical information according to the three patterns outlined previously, it would be desirable to adopt the standpoints of fostering and expanding the various component organizations making up NIST and of increasing the efficacy of the dissemination activities of scientific and technical information by the introduction of overseas files.

Together with this sort of international cooperation, there ha have also been demands in recent years for technical cooperation with the developing countries. Therefore, it will be necessary to proceed with the measures on the basis of this. The dissemination of information to these countries forms the basis of technical cooperation. For this reason, assistance to the developing countries is included in many cases in the information activities carried out by international agencies such as UNESCO (UNISIST) or FAO (AGRIS). However, there are naturally limits on the activities of international agencies, and in some cases only specific fields can be covered. Therefore, in view of the improved international position of our country, it is desired that our country should, in an appropriate manner, carry out cooperation in the information field with the nations of Southeast Asia and other developing countries (transfer of information, introduction of technology, training of personnel, etc.).

In this case, concrete measures for dealing with international cooperation will be studied as the necessity arises by the central

coordinating organization. However, an indispensable precondition for this would be to make surveys of the overseas trends concerning scientific and technical information activities and to make surveys of the trends in the domestic demand for scientific and technical information.

Therefore, while the central coordinating organization itself strives to obtain a grasp of the overseas situation, it will also be necessary, in order to implement these activities, to expand the /51
department for making surveys of this type, probably in the integrated center, in the sense of utilizing existing organizations.

It is also desirable to promote active exchange of personnel with overseas, for instance, by expanding the attache functions, dispatching personnel to international agencies, or inviting personnel from abroad. It will also be desirable to participate positively in international conferences concerning scientific and technical information and to make efforts to grasp the trends overseas. In this way it would be possible to promote a strengthening of this country's base concerning international cooperation and to contribute to international collaboration in the scientific and technical information field.

Section 5. Consolidation of NIST's Base /52

1. Research and Development in NIST

(1) Basic Ideas on Research and Development

In order to cope with the increasing expansion of the amounts of scientific and technical information being generated, with the expanding range of the demand, and with the diversification of the requirements, in order to respond to the demand for rapid and accurate acquisition of scientific and technical information, and in order to facilitate smoother dissemination of information, it is desirable to mechanize the processing and dissemination of information as far as possible. At the same time, the utmost efforts should be made to standardize the necessary items.

For this reason, it is necessary to move ahead with research and development of the information processing techniques and information dissemination techniques which are required in each process of processing and dissemination, while also considering the utilization of existing organs and systems.

Since NIST is a total system embracing the individual subsystems which exist now as well as the individual subsystems which will be established in the future, it will be necessary to forge ahead with technical development so that information can be disseminated smoothly between these individual subsystems. Also

in view of the importance of international exchanges of information, in carrying out this plan it will be necessary to give adequate consideration to the coordination with international information systems.

(2) Projection of Research and Development Tasks

In order to ensure smooth dissemination of scientific and technical information between these individual subsystems, it is necessary to attach great importance to the coordination between the subsystems. Furthermore, since the population for whom the services are intended is a broad one consisting primarily of researchers and specialists, particular consideration must be paid to the following items when developing the research and development tasks for the consolidation of NIST:

(1) It must be possible to exchange information easily between the subsystems in NIST. /53

(2) It must be possible to provide services for efficiently processing large amounts of highly varied information in a form meeting the demands of the users.

(3) In this case, technology must be developed in both the hardware and software aspects for processing Japanese-language materials efficiently.

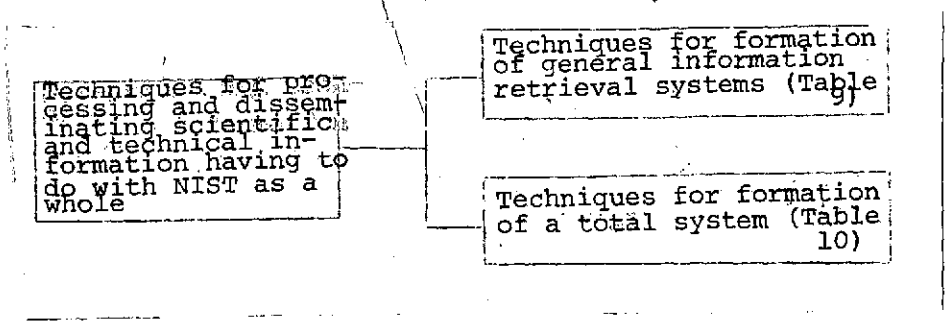
(4) Suitable means, such as technologies involving a highly sophisticated combination of both computer technology and electrocommunication technology, will be necessary in order to make possible information transmission over broad areas.

(5) Provision must be made for man-machine interaction between the user and the system in order to make possible a broad scope of utilization by the user.

When consolidating NIST, it will be necessary to extract accurately the research and development tasks in the individual systems and the research and development tasks in the formation of a total system, and efforts must be made to expedite the solution of these tasks.

Let us summarize, from this standpoint, the research and development tasks in information processing and disseminating techniques which are regarded as necessary in the consolidation of NIST, assuming as a premise that information processing will be mechanized in the future and that telecommunication techniques will be utilized. They may be summarized as shown in Table 8, 9, and 10.

TABLE 8. PROJECTION OF RESEARCH AND DEVELOPMENT TASKS ASSUMING MECHANIZATION OF INFORMATION PROCESSING AND UTILIZATION OF TELECOMMUNICATION TECHNIQUES



(3) Research and Development Procedures in NIST /56

As is clear from Tables 8, 9, and 10, various types of complicated multifaceted research and development in information processing and disseminating techniques are necessary for consolidating NIST under the assumption that information processing will be mechanized and electrocommunication techniques will be utilized. Many of these tasks must be left to future surveys or research and development. When solving these tasks, it will be especially necessary to relate them to each other at every stage from the foundations to practical applications while moving forward with surveys and research and development in parallel. This must be performed in an efficient manner.

For this purpose, when necessary, the central coordinating organization will assume the central role and will move ahead with studies about the following topics, while also taking into consideration the possibility of utilizing existing systems as well:

(1) clarification of the mutual connections between the survey tasks and research and development tasks in NIST, determining which of them take priority, and establishing plans for implementation on the basis of the preceding;

(2) coordination of planning, such as promotion of mutual liaison and cooperative relations between the various information activity agencies, research agencies, or universities while implementing the plans; and making studies concerning research and development organizations for information processing and dissemination techniques.

(3) establishment of Japan Industrial Standards and technical standards for dissemination within NIST for the items necessary in order to maintain smooth information dissemination and interchangeability.

TABLE 9. TECHNIQUES FOR THE FORMATION OF A GENERAL INFORMATION RETRIEVAL SYSTEM

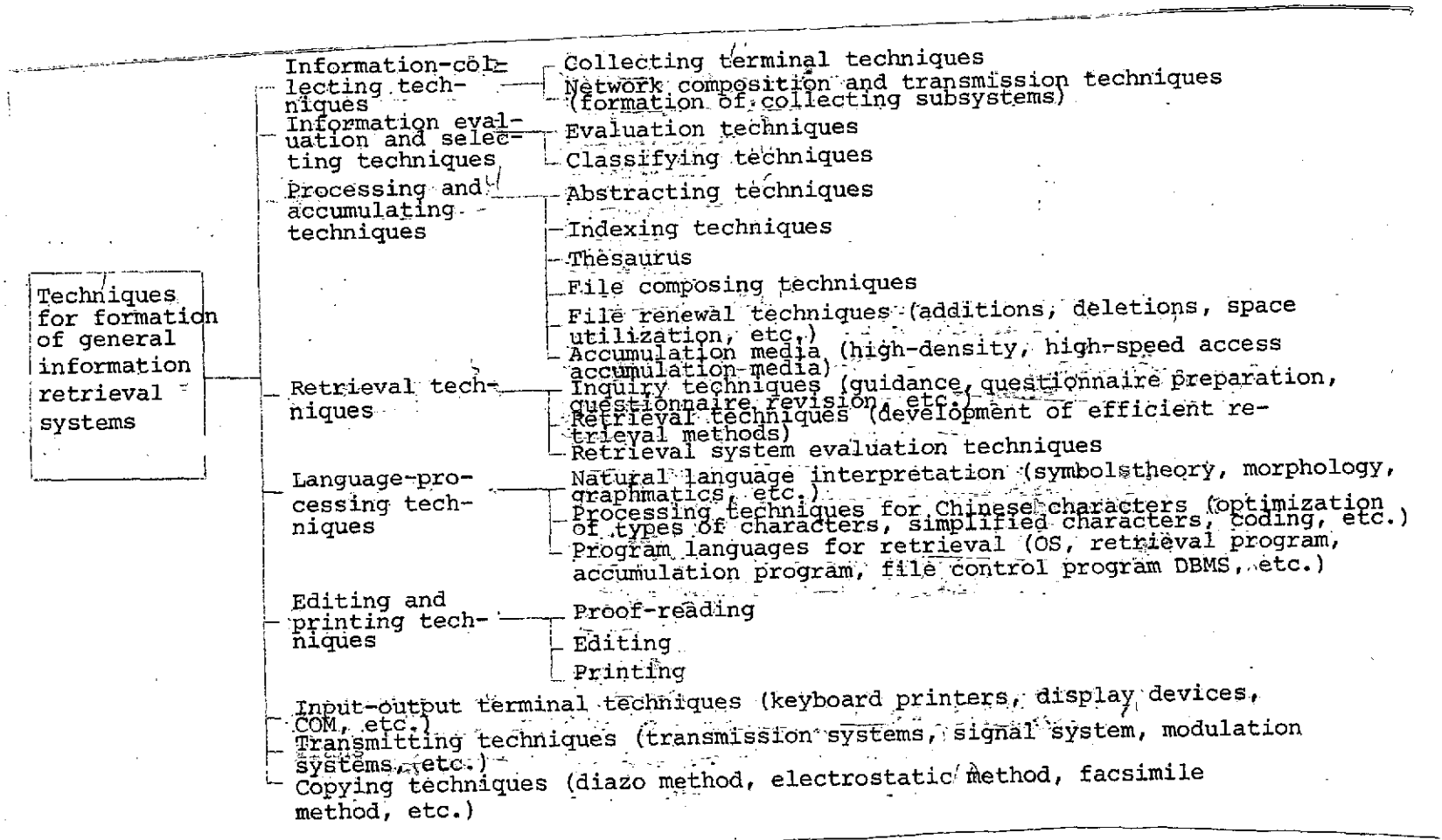
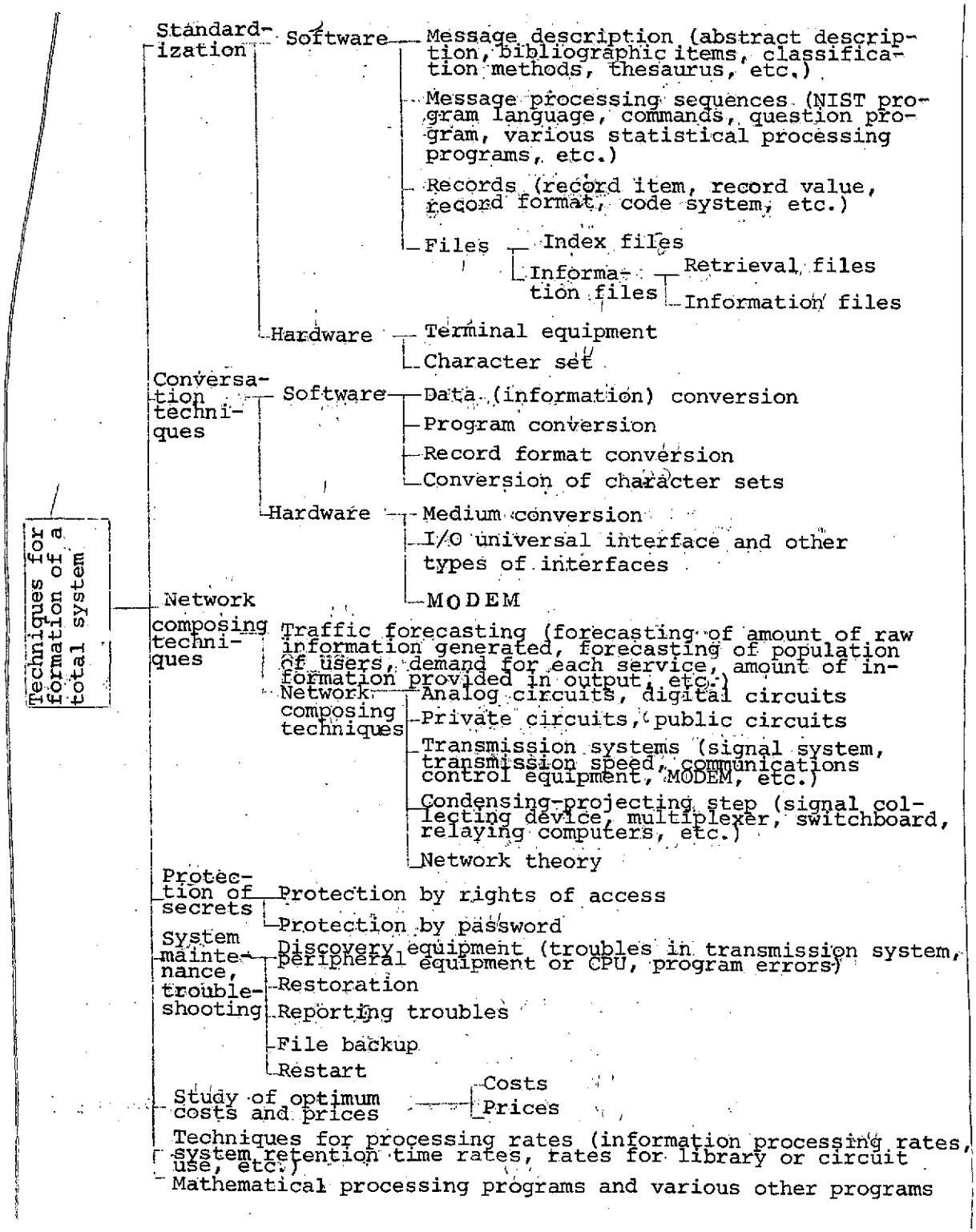


TABLE 10. TECHNIQUES FOR THE FORMATION OF A TOTAL SYSTEM /55



(4) popularization of the techniques obtained by research and development.

At the same time, the following must be done, chiefly by the national government, in order to consolidate NIST as a unified system embracing subsystems:

(1) A beginning must be made rapidly on the surveys and analysis necessary in order to clarify the component elements of each of the many individual systems which are the subsystems.

(2) The problems connected with the interfaces between the various systems must be solved.

(3) A suitable area where there are many subsystems concentrated, such as the Tsukuba research and academic city, must be selected for performing model experiments in order to form the optimum network. /57

2. Training and Securing of Personnel in NIST

(1) Basic Ideas

In order to establish NIST and to promote the smooth dissemination of scientific and technical information, it will be necessary to train and secure the personnel serving in NIST.

In the dissemination of scientific and technical information, basically it is necessary for the information producer to produce the scientific and technical information with the intention for it to be disseminated, for information processing specialists to process it accurately, and for the information user to be able to utilize it effectively. For this purpose, the related persons must maintain the necessary grounding in information science techniques and to be trained in suitable processing methods.

As measures concerning the training and securing of personnel in NIST, the consolidation and expansion of the systems of undergraduate education and postgraduate education, as well as improvements in the conditions for those employed in scientific and technical information work are conceivable.

Together with this, it is also necessary to educate the general public and to raise their level of consciousness about scientific and technical information activities in order to obtain broad understanding and awareness.

(2) Measures for Training and Securing Personnel in NIST /58

The personnel employed in NIST can be thought of more or less in terms of the classification scheme shown in Table 11. It is desired that the following measures be implemented in order to promote the training and securing of this personnel.

(1) Amplification of Academic Education

The education available in the institutions of higher education today consists mostly of education centering around library science and that centering around so-called information engineering. At the present time, there are only highly limited courses dealing specifically with documentation. Since specialists in scientific and technical information in NIST will be required to have knowledge of both information engineering and documentation, it will be necessary to promote consolidation and amplification of the academic education in these fields. Since there are few educators in the field of scientific and technical information science, measures will also have to be taken to expand this stratum.

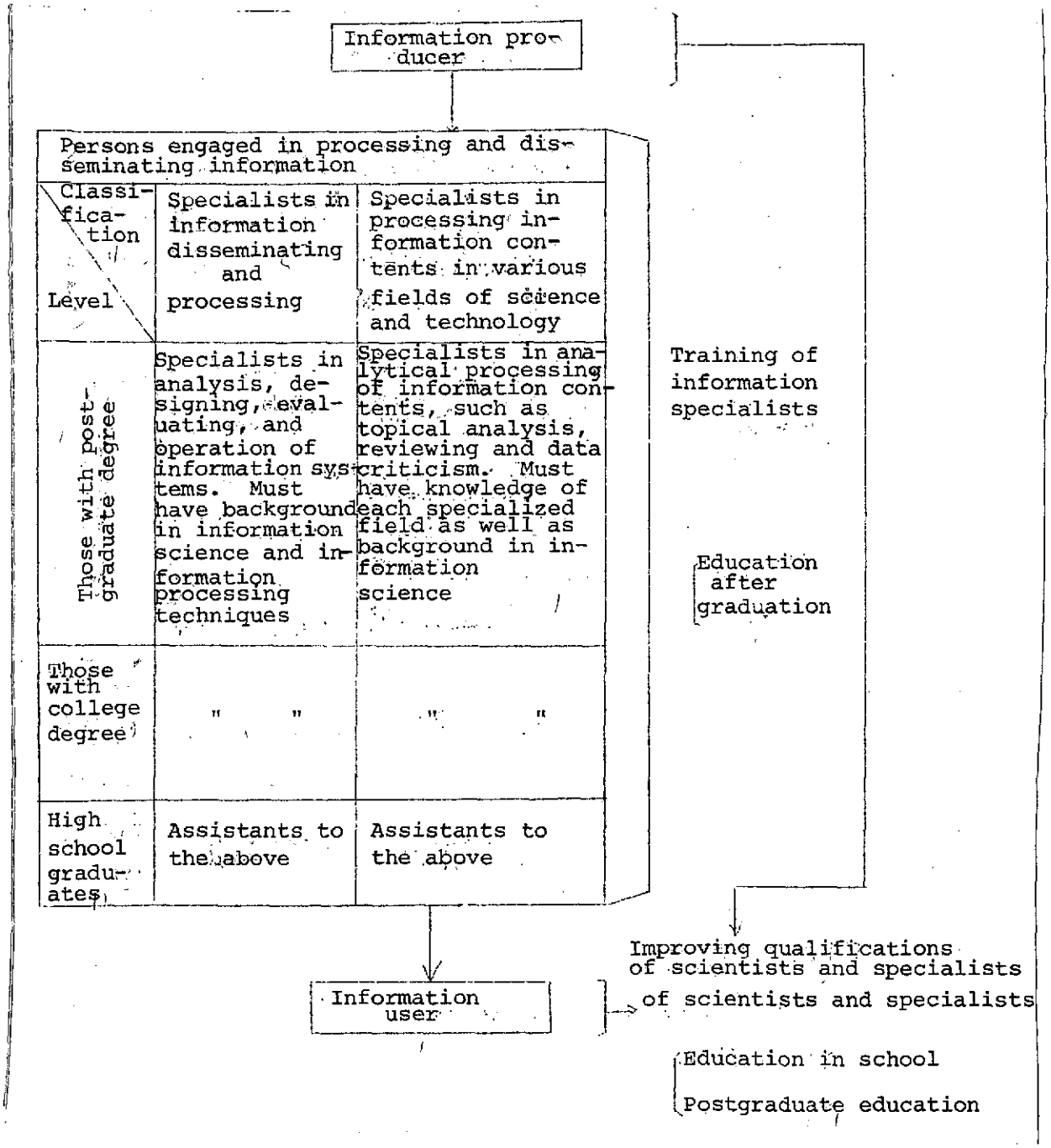
It will also be necessary to amplify the curriculum so as to give both the information producer and the information user knowledge about how to write scientific and technical monographs, how data are organized, and how to utilize information.

(2) Amplification of Postgraduate Education

With respect to postgraduate education, courses of lectures for various purposes are being given in various agencies. However, viewed from the standpoint of the training curriculum for specialists in scientific and technical information work, they can hardly be said to be systematic. Therefore, it will be necessary for the national government to play the leading role in obtaining an accurate grasp of the demand for manpower and developing a program for personnel training. At the same time, it will also have to consolidate the system connected with training programs for scientific and technical information.

In this type of education, consideration will also be given to the utilization of existing facilities, and whe necessary it is considered to be suitable for the integrated center to play the central role. From the viewpoint of international cooperation, it will also be necessary to give due consideration to the acceptance of overseas trainees in scientific and technical information. /60

TABLE 11. PERSONNEL COMPOSITION /59



(3) Conditions of Workers in Scientific and Technical Information Work

Since the work of processing and disseminating scientific and technical information requires a high level of knowledge and experience, study must be given to the suitable conditions of employment for workers engaged in scientific and technical information activities and to the improvement of their positions. Studies must also be made about the consolidation of a system of specific qualifications for highly trained specialists.

(4) Public Relations Effort to Popularize Scientific and Technical Information Activity

Since the scientific and technical information activities in NIST embrace such a broad range of contents, it will be necessary to carry out public relations activities concerning it. Especially since scientific and technical information activities in this country have lagged behind in the past, it is desired that public relations efforts will be directed at the general public in order to raise the level of consciousness concerning this type of activities.

Section 6. Measures for Consolidating the Deliberative and Administrative Organization /61

(1) Basic Ideas

The organization for carrying out comprehensive deliberations concerning information activity in science and technology and for incorporating the results in administrative decisions is at present not consolidated in our country, and the promotion of information activities is therefore low-keyed. Consequently, it is difficult, under these conditions, to consolidate a harmoniously organized information dissemination system. This is also one reason why scientific and technical information activities as a whole have remained on such a relatively low level.

Basically, scientific and technical information activities have the goal of providing researchers and specialists access to the information they need, not only in their own specialized fields, but in all fields of science and technology. Especially in recent years there has been a pronounced increase in the amount of information generated, while at the same time the requirements for science and technology have become broader and broader as a result of the qualitative improvement and diversification of social activities. Therefore, the forms of information activities themselves have become more complex. It is essential, in order to cope accurately with these circumstances and to promote smooth

dissemination of information, to consolidate the systems and organizations to enable the various projects which are necessary (such as consolidating the individual information systems or organizing them into networks) to move forward comprehensively in the form of a well-harmonized whole.

Therefore, in forwarding the NIST plan, it is desired that a suitable deliberative and administrative organization be consolidated. Our country demonstrably lags behind the Western countries in this aspect also, but the following measures ought to be taken in order to fill up these gaps and to formulate and implement an information policy suited to this country.

(2) Consolidation of the Deliberative Organization /62

At the present time, information dissemination activities in this country are mostly operated only at the level of circles of specialists in a given field. Even in those cases where an open system is adopted, there is much which is difficult of access to the general user, and from the standpoint of the nation as a whole, there are the problems of lack of smoothness of mutual exchange of information between the fields and the duplication of the information activities themselves. Thus, for the sake of promoting the NIST work as a comprehensive project, there are increasing demands for carrying out studies from a comprehensive viewpoint on the following matters: the compilation of a basic, comprehensive plan concerning the nation's scientific and technical information activities; the promotion of basic activities such as research and development for the basic, common items; and study of measures for assisting in raising the level of information activities.

In order to accomplish this, it is regarded as necessary to have an organization which would conduct surveys and deliberations, from a comprehensive viewpoint, concerning the measures for promoting scientific and technical information activities as a whole, which would indicate the basic orientation for them, and which would reflect the results in the administrative area.

Basically, it would be suitable for this organization to discuss the following items:

(1) the basic, comprehensive measures for promoting scientific and technical information activities in general;

(2) basic and comprehensive long-range or medium-range consolidation plans concerning scientific and technical information activities.

(3) measures for liaison and coordination between the organs having to do with scientific and technical information activities.

(3) Consolidation of the Administrative Organization

The consolidation of the administration organization is necessary in order to promote information activities from the administrative area, such as in formulating concrete basic measures concerning scientific and technical information activities, fostering the various centers and consolidating the systems in relation to the dissemination of information. Especially together with /63 the aforementioned deliberative organization, it will be necessary to consolidate the administrative organization centering around close cooperation and consolidation between the relevant governmental agencies.

This organization will carry on the following activities:

(1) planning, drafting, and implementing basic, comprehensive policies for the promotion of scientific and technical information activities

(2) overall coordination of the work connected with promoting scientific and technical information activities in the relevant administrative agencies

(3) surveys and analysis of the domestic and foreign trends concerning scientific and technical information activities.

When necessary, it is desirable for the organization to take inductive measures for the accurate promotion of information activities, such as by granting the necessary funds for consolidation.

[Note: No page 64 in original.]

REFERENCE MATERIALS

[Note: No page 66 in original.]

I. Significance of Scientific and Technical Information Activity /67

1. The Necessity of Scientific and Technical Information Activity

(1) Why Is Information Necessary?

(1) In order to put into actual applications as quickly as possible the results of the development of science and technology in the world and in Japan, before all else it is necessary to obtain the latest scientific and technical information.

(2) When researchers or specialists are about to embark on research and development, they must first of all know whether the same research and development is being carried on already somewhere else in the world. If it has already been commenced, they must learn how far it has proceeded and the state of the other related fields.

(3) Furthermore, in the process of research and development, it is important for the advance of the research and development to know the contents of similar research and development which is being carried out elsewhere. Researchers and specialists must also have a grasp of the scientific and technical information as an accumulation leading them to the next research and development.

(4) Besides, when utilizing research and development or its results, acquisition of the basic data is indispensable.

(2) Amount of Information Doubles in One Decade

With the recent rapid progress of science and technology, the amount of related information is increasing tremendously. If we examine this in terms of monographs, which are the most typical sources of information, we learn that about 50,000 scientific and

technical periodicals are being published regularly in the world at the present time. About 700,000 patents are granted annually, and the number of learned theses and dissertations, reports, and materials delivered at scientific conventions has reached immense proportions. In terms of the total number of monographs, four million are published annually, and there is a tendency for this to double about every 10 years. /68

(3) Research and Development Activities and Acquisition of Information

Needless to say, immense amounts of time and effort are necessary for the sake of obtaining what is necessary from this immense amount of information, which may be likened to a deluge. In fact, although there are differences from one field to another, there are data indicating that 30-50% of the entire time devoted to research and development is spent in the acquisition and surveying of scientific and technical information.

If the acquisition of information is insufficient, the research may duplicate that performed by other researchers, and this may lead to wasting of research funds. There are survey results indicating that more than 40% of the researchers in this country have experienced duplication of research.

Furthermore, the majority of the latest achievements in science and technology have been born from the so-called borderline areas, so that in research and development it has become necessary to acquire information from fields other than one's own field of specialization. There are survey results showing that approximately half of the monographs needed in a certain field are obtained from journals ordinarily considered to be specialized periodicals in that field, but that the remaining half are obtained from journals considered to be specialized periodicals belonging to other fields.

(4) Information Activity Assists in Increasing Efficiency of Research and Development and In Putting Research and Development into Practical Application

The easier it becomes for researchers and specialists to obtain quickly adequate information they require without expending too much time and labor on it, the more will they be able to concentrate on their own basic research and development activities. Consequently, they will be able to perform research of a higher quality, and this will lead to efficient utilization of the costly expenditures for research. Besides, if the achievements of the latest research and development are promptly and widely disseminated, the useful achievements of research and development will be

put into practical application at an early date. This will be an extremely great contribution to the improvement of the national economy and the national livelihood.

(5) Actuality of the Establishment of Information Dissemination Systems /69

The advances in computer technology in recent years have made it possible to raise the levels of information processing, and the advances in communication techniques have made possible the extensive dissemination of information over broad areas. In addition, the development of microfilm techniques have made it easy to accumulate information. Attempts to utilize these techniques in information activities have begun to be made separately by public organizations and in the private sector. For example, the Japan Information Center of Science and Technology believes the implementation of on-line service to be an urgent task and has commenced to develop such service.

These advances in information processing, accumulating, and disseminating techniques have already made possible the accurate and rapid dissemination of immense amounts of information. It is precisely from this viewpoint that attempts are made to accelerate the dissemination of scientific and technical information, and various measures are being taken to provide powerful impetus to the dissemination of scientific and technical information, not only in the United States and the Soviet Union, but also in the major European countries and in international organizations such as the OECD.

2. The Standpoint of the National Government in Scientific and Technical Information Activities /70

It is necessary, for the following reasons, for the national government to play the chief role in promoting scientific and technical information dissemination activities.

(1) Mutual Utilization

From the standpoint of the most efficient utilization of the scientific and technical information in the nation as a whole, it is necessary to create a system in which specialized information in science and technology will not be utilized only by the specialized field, but will be able to be utilized broadly also in other related specialized fields. (For example, iron and steel information must not be restricted only to the use of the iron and steel industry, but must be made readily available also to the related fields of industry such as shipbuilding and machinery and

to the fundamental research sector such as the universities and national testing and research agencies.) The national government must play the leading role in organizing such a system.

(2) Unification of Information Dissemination System

When the various information agencies are organized in the form of separate, isolated systems, information will be difficult to disseminate and will be of little effect in the national economy. This is a great loss, especially is we consider the possibility that electronic computers and communications channels will go over to the on-line system in the near future. For this purpose, it is necessary for the national government to proceed with standardization of the dissemination system.

(3) Comprehensive Areas and Borderline Areas

The national government must also play the leading role in consolidating the dissemination system for information belonging to areas embracing a number of specialized fields such as environmental pollution and oceans and for that belonging to borderline areas such as the life sciences.

(4) Public Fields

The national government or public agencies must play the leading role in consolidating the information dissemination system for public fields such as the environment, disaster prevention, urban planning, medicine and public health, telecommunications, agriculture, forestry, fisheries, medium and small enterprises, pioneering science and technology (nuclear power, space, ocean, life sciences, etc.), and basic, fundamental science and technology /71 (earth sciences, natural resources, energy, etc.).

(5) Basic, Common Information

It is desirable for the national government to collect and organize exclusively the basic, common information (15% of the total quantity of information). This is desirable in view of the efficiency of the information services for the entire nation (consolidation of the integrated center).

(6) Collaboration with Foreign Countries

The information generated within the country is only a small part of the total information generated in the world, and it is necessary to consider collaboration with overseas information

service agencies. In this case also, it would be effective if the national government were to play the chief role.

(7) In the preceding it has been stated that it would be desirable for the national government to play the chief role in promoting the aforementioned consolidation of the system for dissemination of scientific and technical information. However, this is by no means a suppression of private information activities. As has been mentioned in the report, it is extremely important to maintain close connections with the related agencies, including those in the private sector, and to take measures for assisting them when necessary.

II. Trends in Scientific and Technical Information Activity in This Country /72

1. Scientific and technical information activity in this country has been carried on in the past by more than 500 scientific and technical associations and societies devoted to scientific and technical subjects, centering in the Japan Information Center of Science and Technology, and by various types of libraries, chiefly the National Diet Library.

The Japan Information Center of Science and Technology was established in 1957 as a special corporation to play the nuclear role in this country's scientific and technical information activities. It collects, on an all-embracing, comprehensive basis, the scientific and technical monographs both from domestic sources and from overseas, processes them, edits them according to field and according to purpose, and makes them available.

There have also been organizations carrying out specialized information services, such as the provision of primary information services by scientific associations and societies and the work of the information departments of some agencies such as the Japan Atomic Energy Research Institue and the Shipbuilders' Association of Japan.

2. In this connection, now that the concept of NIST has been formulated in an effort to cope comprehensively with the processing and dissemination of information, which is increasing in quantity in geometric progression, and with the diversified information needs, the various concerned agencies are about to embark on positive activities.

At the Science and Technology Agency, systems analysis has been performed in order to promote the concrete realization of NIST, and work of creating its base has been carried out.

On the other hand, a considerable number of specialized agencies devoted to the processing and dissemination of information have come to be established and consolidated. That is, in the national government, plans have been formulated for carrying on information activities in such fields as environmental pollution (Environment Agency), agriculture (Ministry of Agriculture and Forestry), medicine (Ministry of Health and Welfare), and medium and small enterprises (Ministry of International Trade and Industry). Some of these plans have already been realized concretely.

There are also indications that activities are being pushed forward also in the fields of disaster prevention, oceans and life sciences.

In the private sector as well, information centers such as the International Medical Information Center, the Japan Drug Information Center, and the Japan Patent Information Center have been set up one after another, and specialized information center activities are about to commence also in fields such as chemistry and iron and steel. /73

III. Trends in Scientific and Technical Information Activity Abroad /74

1. United States

(1) In the United States, a number of organizations devoted chiefly to scientific and technical information activities have been established. They include the Committee on Scientific and Technical Information (COSATI) in the Federal and Science and Technology Council and the Office of Scientific Information Services (OSIS) in the National Sciences Foundation (NSF), which is an administrative agency. Both of these agencies are carrying out various measures concerned with drafting basic policy concerning scientific and technical information activity, promoting research and developmeng concerning information science and technology, and activating the information service activities of the private sector.

According to statistics of the NSF, in 1974 the Federal Government as a whole spent more than 130,000,000,000 yen (and another 100,000,000,000 yen for data processing activities) for activities such as information processing and dissemination. NSF itself gives assistance amounting to about 3,000,000,000 yen annually to promote information activities in the private sector.

(2) In the United States there is no comprehensive system for information processing and dissemination which covers all

fields of science and technology, and the main emphasis is placed on consolidation of information systems in the individual fields such as chemistry, physics, biology, and medicine. In many cases, the activities in these fields are being carried on by the scientific associations and societies, although NSF supplies assistance for the development and improvement of these systems.

Even though there is no comprehensive system, clearing organizations have been consolidated to make up for this lack and to play the role of connecting the systems with each other. Such organizations, each fulfilling different functions, are the Smithsonian Information Exchange (SIE, information about research topics), the National Referral Center for Science and Technology (NRC, information about agencies, researchers, and other information course), and the National Technical Information Service (NTIS, publicity and supply of government publications). Through these agencies, the user is guided to accurate sources of information. /75

(3) Among the individual information systems above, there is the MEDLARS of the National Library of Medicine, the CAS of the American Chemical Society, and the BIOSIS in the field of biology. Against their background of domestic information activities within the United States, they are currently moving out into the international arena to a considerable degree.

2. West Germany

(1) Processing and dissemination of scientific and technical information has been performed in West Germany in the past by various specialized information centers. Recently, however, a comprehensive plan for promoting information processing, including these centers, has been formulated. The plan aims at consolidating the approximately 600 information-connected agencies located in the country in 15 specialized fields, such as medicine, biology, chemistry, electricity-physics-mechanics, and geology-mining, and to consolidate their mutual relationships. The goal is to avoid duplication of work and financing, to form an efficient total system, and to facilitate its operation.

This plan spans the period of 4 years from 1973 to 1976, and it is estimated that the funds required will amount to about 60,000,000,000 yen.

(2) Also in West Germany, a documentation research institute was established in 1961 at the Max Planck Society. It has been giving assistance to information activities in the private sector.

3. France

(1) In France, the documentation center belonging to the National Scientific Research Center (CNRS) (450 employees, number of monographs processed 500,000 -- the Japan Information Center of Science and Technology has 336 employees and processes 370,000 monographs) processes information chiefly having to do with basic science and life science. It plays the nuclear role in scientific and technical information activity in France. However, in addition, processing and dissemination of information has been performed in the past by specialized agencies in very many fields, such as telecommunications and aeronautics. /76

(2) Furthermore, in February of last year, the National Bureau of Scientific and Technical Information (BNIST) was established by order of the Prime Minister's office. It was entrusted with the duties of drafting policy concerning all scientific and technical information from the fundamentals to applied technology, formulating plans, and implementing and supervising them with the cooperation of the relevant agencies. In the future, work will be done to consolidate the aforementioned highly diversified agencies, to form an information network, to perform fundamental research, to standardize, and to train personnel.

4. Great Britain

In Great Britain, the Advisory Council for Scientific and Technical Information (ACSTI) and the Office of Scientific and Technical Information (OSTI) were established in 1965, the latter in the Ministry of Education and Science, on the basis of the recommendations of the Advisory Council on Scientific Policy. Both of them are engaged in deliberations on the fundamental items concerning a broad range of scientific and technical information activities, including library activity, and in consolidating and assisting the information activities of the related agencies. The National Lending Library for Science and Technology (NLL) is the central organ offering scientific and technical information services. More recently, the Information Service for Physics, Electrical Engineering, and Control Engineering (INSPEC) had been consolidated and is now entering the international arena.

5. Soviet Union

In the Soviet Union, the All-Union Institute for Scientific and Technical Information (VINITI) was established in 1952 under the jurisdiction of the Soviet Academy of Sciences and the State Committee for Science and Technology. This is today the world's largest centralized information service agency. The fields

handled by VINITI (3500 employees, number of monographs processed 1,000,000) include all fields of science and technology except medicine, agriculture, architecture, and civil engineering. There are separate All-Union information centers for the fields not covered (for example, the All-Union Institute for Information on Medical and Therapeutic Techniques).

6. Information Activities by International Agencies /77

(1) In addition to the emergence of information systems of specific countries, such as the aforementioned CAS and MEDLARS, in the international arena, there has been a movement in recent years towards forming varied international information systems, especially by the specialized agencies of the United Nations.

UNESCO, with the cooperation of the International Union of Learned Societies (ICSU), is moving ahead with plans for UNISIST (World Scientific Information System). It was established in 1973 with the ultimate goal of creating a worldwide service network with elastic, loose bonds on the basis of the expansion of spontaneous collaboration between the information service agencies of the countries of the world. For the time being, it will function as the medium leading to the developments needed in fields such as basic science, applied science, and engineering.

The United Nations Food and Agricultural Organization (FAO) is also going to consolidate an international information system (AGRIS) concerning agriculture and agriculture technology with the participation of many countries or agencies.

In addition, there are the International Nuclear Information System (INIS), run by the International Nuclear Agency and the International Resource Service (IRS) concerning the evironment, the establishment of which was proposed by the United Nations Conference on Human Environment. Countries of the world are moving ahead positively with participation in these agencies.

It is expected that the tendency to form information systems by these international agencies will grow more and more pronounced in the future.

(2) On the other hand, there are some international agencies which are dealing with the questions of policy of scientific and technical information activity, such as the Organization of Economic Cooperation and Development (OECD), UNESCO, the ICSU, and the International Standardization Organization (ISO).

Among these, the OECD has an information policy group established under its Scientific and Technical Policy Committee. It is /78

working positively in exchanging opinions concering information policy among the member nations, in studying the future perspectives for information activities, and in studying the problems in information networking.